DECEMBER 30, 1943

The IRON AGE

THE IRON AGE, published every Thursday by the *CHILTON CO. (INC.)*. Entered as second class matter November 8, 1932, at the Post Office at Philadelphia under act of March 3, 1879. $8 yearly in North America and South America, Foreign $15. Vol. 152, No. 27.

J. H. VAN DEVENTER
President and Editor

C. S. BAUR
Vice-President & General Manager

o o o

Editorial and Advertising Offices
100 East 42nd St., New York 17, N. Y., U. S. A.

O. L. Johnson, Market Research Mgr.
B. H. Hayes, Production Manager.
R. E. Baur, Typography and Layout.

o o o

Regional Business Managers

C. H. OBER, New York 17, 100 East 42nd St.
H. E. LEONARD, New York 17, 100 East 42nd St.
ROBERT F. BLAIR, Cleveland 14, 1016 Guardian Bldg.
W. J. FITZGERALD, Pittsburgh 22, 428 Park Bldg.
B. L. HERMAN, Philadelphia 39, Chilton Bldg.
H. K. HOTTENSTEIN, Chicago 3, 1134 Otis Bldg.
PEIRCE LEWIS, Detroit 2, 7310 Woodward Ave.
D. C. WARREN, Hartford 1, Conn., P. O. Box 81
R. RAYMOND KAY, Los Angeles 28, 2420 Cheremoya Ave.

o o o

Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Offices
Chestnut and 56th Sts.,
Philadelphia 39, Pa., U.S.A.

OFFICERS AND DIRECTORS
C. A. MUSSELMAN, *President*
JOS. S. HILDRETH, Vice-President
GEORGE H. GRIFFITHS, Vice-President
EVERIT B. TERHUNE, Vice-President
J. H. VAN DEVENTER, Vice President
C. S. BAUR, Vice-President
WILLIAM A. BARBER, Treasurer
JOHN BLAIR MOFFETT, Secretary
JULIAN CHASE, THOMAS L. KANE
G. C. BUZBY, P. M. FAHRENDORF
HARRY V. DUFFY, CHARLES J. HEALE

o o o

Member, Audit Bureau of Circulations

Member, Associated Business Papers

o o o

Indexed in the Industrial Arts Index. Published every Thursday. Subscription Price North America, South America and U. S. Possessions, $8; Foreign, $15 a year. Single Copy, 35 cents.

o o o

Cable Address, "Ironage N. Y."

o o o

This Week in The IRON AGE

Vol. 152, No. 27 December 30, 1943

Editorial

o o o

Technical Articles

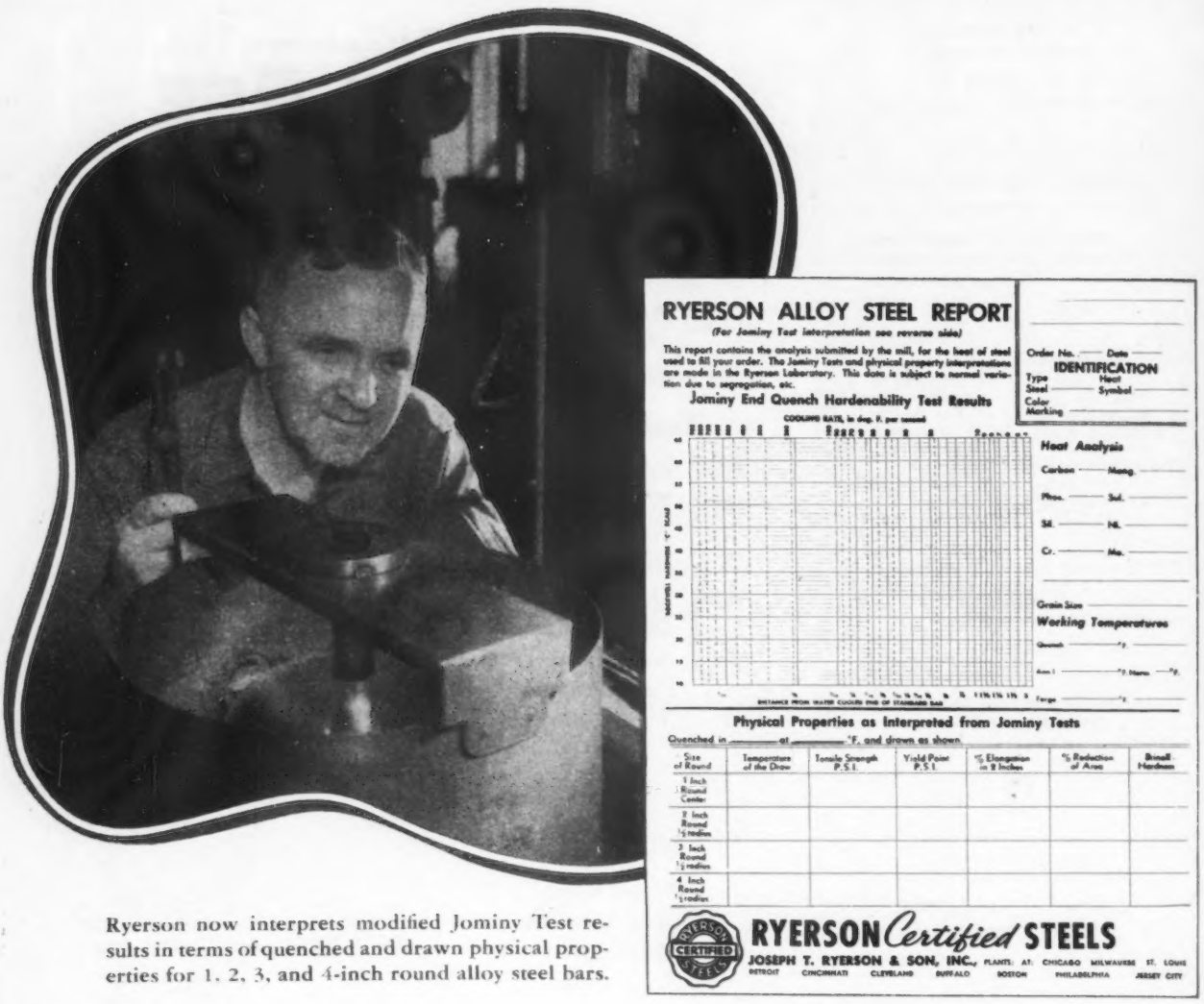
o o o

Features

o o o

News and Markets

o o o



Ryerson now interprets modified Jominy Test results in terms of quenched and drawn physical properties for 1, 2, 3, and 4-inch round alloy steel bars.

New Data on Alloy Physicals

Ryerson furnishes hardenability interpretations with each alloy steel shipment

The new Ryerson Alloy Steel Report sheet is furnished with each shipment of alloy steels from stock. This report includes: a positive identification for the steel you receive . . . its chemical analysis as reported by the mill . . . the recommended working temperatures of the steel . . . a chart of its hardenability response with interpretations of the physical properties *after* heat treatment and the effect of mass on the physicals of 1, 2, 3, and 4-inch bars.

All this information makes it easier for you to specify your alloy steel requirements in terms of *what the steel will do* . . . rather than on analysis alone. It further guides you in the proper heat treatment of your steel to obtain the best results.

Ryerson engineers and metallurgists will gladly assist you in any problem of steel selection, application or fabrication. Investigate this helpful service next time you need steel from stock.

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Cincinnati, Buffalo, Boston, Philadelphia, Jersey City.

RYERSON STEEL–SERVICE

The
IRON AGE

ESTABLISHED 1855

o o o

Dec. 30, 1943

o o o

J. H. VAN DEVENTER
President and Editor

C. S. BAUR
Vice-President and General Manager

o o o

A. H. DIX
Manager, Reader Service

o o o

Managing Editor.....T. W. LIPPERT
News, Markets Editor...D. R. JAMES
Technical Editor.....F. J. OLIVER
Art Editor.....F. J. WINTERS

o o o

Associate Editors
D. C. MacDONALD
S. H. BARMASEL

Editorial Assistants
M. M. SCHIEN
G. B. WILLIAMS
G. P. BUTTERS

Regional News and Technical Editors
T. C. CAMPBELL
Pittsburgh 22
428 Park Bldg.

C. T. POST
Chicago 3
1134 Otis Bldg.

L. W. MOFFETT
DONALD BROWNE
EUGENE J. HARDY
Washington 4
National Press Bldg.

T. E. LLOYD
Cleveland 14
1016 Guardian Bldg.

S. H. BRAMS
Detroit 2
7310 Woodward Ave.

OSGOOD MURDOCK
San Francisco 3
1355 Market St.

Editorial Correspondents
ROBERT McINTOSH
Cincinnati

C. M. PENLEY
Buffalo

G. FRAZAR
Boston

HUGH SHARP
Milwaukee

F. SANDERSON
Toronto, Ont.

R. RAYMOND KAY
Los Angeles

JOHN C. McCUNE
Birmingham

ROY M. EDMONDS
St. Louis

JAMES DOUGLAS
Seattle

An Overlooked Postwar Factor

WAR changes people as well as geopolitics. The boundaries of our country will not be changed much after this war in the geographical sense, but the mental horizons of our people will be greatly enlarged. And if we do not think of this psychological postwar factor in making plans for doing business, we will be missing the boat.

The cream of the nation has gone or will go to war. Armed forces of eleven million people mean that some fifteen million or more will probably have been uprooted from customary environments before the conflict is finally over and will have been subjected to experiences that will make them entirely different from what they were to begin with. They will have become disciplined in the hardest school of hard knocks. They will be toughened in physical, mental and moral fibre. A great majority of them will have received specialized training and education far beyond what they would normally have gotten in a peace time economy. They will have learned to be resourceful in overcoming seemingly impossible obstacles and determined in reaching their objectives.

These fifteen million of the cream of America, will not all return to us after the war. But the great majority of them will and they will form the backbone and the viscera of this country for ten years or more thereafter. And the way that they think will determine what kind of a country this will be, for "as a man thinketh, so is he."

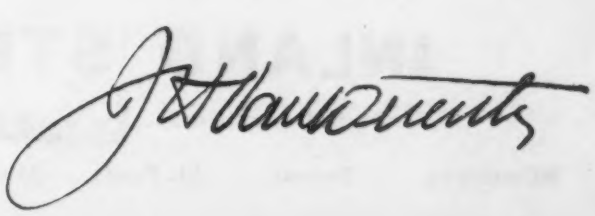
Uprooted from home environments from which normally they might not have strayed far, most of these millions will have traveled over a large part of America and have visited the four corners of the globe. They will have formed mental backgrounds by seeing how other people live and act; other people in other nations as well as many people in our own. And from these exposures they will have formed ideas of what they want to be and what they want to have when they come back home.

These people will know what they want and our postwar planning should be directed toward making it possible for them to get it.

They will want more than they had when they left. They will want wives and families and homes, or better homes and more possessions than were had by the wives and families they left behind them. They will be willing to work hard for these things because they have learned through the hard school of war that something cannot be had for nothing. But they will want jobs to work at.

And they will know what they do not want. They will have had opportunity to appraise both the virtues and the defects of our democracy in America through comparison with other countries. And I do not think they will be tolerant of the rackets and racketeers of whatever class or stripe that constitute democracy's worst defect.

When wants multiply and willingness to work to satisfy them go hand in hand, you have a setting for real and solid prosperity. But not unless industry lives up to its postwar task of producing more and better goods for more people at lower prices.



There are many types of employment open to women — machine operation, welding, stenography, laboratory work, etc. The need is so great that a woman should be able to find exactly the type of work for which she is best suited.

Perhaps Joan Could Help, Too!

Have you stopped to consider there is a place for your sister, your daughter—yes, even your wife—in the great effort the metal working industry is making to help win this war?

Through your everyday conversation the women in your family realize the need for more production. They know about the shortage of workers. They know that it is patriotic to work, but because their place has been in the home, many of them are timid about going to work in an office or factory.

You, as a worker in America's great metal industry, can dispel that timidity by telling them about the many kinds of jobs open to women. Let them know that they are as safe in the factory as in the home; that modern American factories are clean; and that factory associations are interesting.

Talk to Joan, Helen, Barbara this evening. In years to come they will be proud of the work they did to help keep America's homes safe and free.

ARMY E NAVY

Check your local help wanted ads for specific needs in your area, or ask the local U. S. Employment Service.

INLAND STEEL COMPANY

38 S. Dearborn St. 50th ANNIVERSARY Chicago 3, Illinois

Milwaukee Detroit St. Paul St. Louis Kansas City Cincinnati New York

IRON AGE
DEC., 30, 1943

NEWS FRONT

• At WLB hearings, steel operators insisted that general price increases would of necessity follow a general wage rise. Since practically all contracts of the steel industry have fixed prices, however, no retroactive price adjustments can be made to absorb increased labor cost.

• Because of joint action of labor and industry members of WLB in voting down the compromise proposal offered by the public representatives, the public members turned to unite with industry in defeating by an 8-4 vote the CIO-USW petition for retroactive application of union demands.

• During 1943, 30,000 freight cars were produced. Average annual production for the five years ended Dec. 31, 1941, was 48,000. Authorization for 50,000 during 1944 has already come from WPB.

• Light metals and plastics will not menace the steel industry, Dr. John M. Weiss, industrial chemist, reported to the American Chemical Society. Stimulation of alloy steel production will bulwark steel manufacturers. Nor will increased use of plastics hinder light metal development, he stated.

• Because of the improved supply situation, warehouses can now handle hot rolled or cold finished alloy steels in NE-8600, NE-8700 or NE-9400 series.

• Serious bottleneck in the truck program is shortage of facilities for large tire casings. Cutbacks of 100,000 to 200,000 units is contemplated. Original military truck program called for about three-quarters of a million in 1944.

• Post-war auto tires may be mounted on wide rims. Although requiring anywhere from 4 to 50 lb. more metal per wheel, tire life is increased. Smaller wheels, (which use less steel) and jumbo tires increase riding comfort, however, and also are being considered by auto-makers for post-war.

• Increased output of the Garand rifle and carbine has minimized need for the modified Springfield. Therefore, manufacture of this weapon will cease in February. Remington Arms will continue to make spare parts until August.

• Instead of a flat bonus asked for by the UAW bargaining committee from the Wolverine Tube Division, a profit-sharing program was inaugurated.

• Pumping to free iron ore deposits under Steep Rock Lake has already begun, six months ahead of schedule. When 60 per cent of the water is removed, mining operations will start on the "B" ore zone, largest ore body. Operations at the "A" and "C" bodies will follow as lake level recedes.

• After announcing last month that the Army was developing a good dollar watch, the War Department has investigated the cost of retooling for production of an expendable watch and found that the cost would come to at least $4.50. An accuracy sufficient for battle use was unobtainable for less.

• As a forerunner of much greater liquidation of motive power, the Army has just released more than 10,000 commercial vehicles of 1939 and earlier models, mostly trucks; 989 new 1942 passenger cars, and about 50 new motorcycles.

• Export freight movement in November, up 76 per cent from last year, established a new record. Valued at well over $1,000,000,000, approximately 85 per cent was Lend-Leased.

• OPA, under orders from Congress, has banished all professors and substituted practical business men. In charge of the export price controls, in place of the quite satisfactory Dr. Harris who has gone back to Harvard, is a business man. Not an exporter perhaps--he's a restaurant man.

• A German propaganda broadcast states that technologists have developed a new structural material from waste paper. It's supposed to be an excellent substitute for aluminum, and is being manufactured in large quantities.

• The Finns have just released detailed technical data on captured Russian planes, particularly on the LAGG-3, the rocket carrying tank buster. Three special rails under each wing carry rocket fragmentation bombs; velocity increment due to the rocket charge is 8250 ft. per sec., sufficient to force the projectile through 6½ in. of armor plate. This weapon has been used also in aerial combat, registering hits up to 2000 ft. range.

Scheduled Machine

SOMEONE has said that "the price of Liberty is eternal vigilance." The same may be said of machine maintenance in war production shops. Productivity of a plant must, because of the war, be sustained at the highest possible level. Machine and machine parts replacements take weeks and often months, and there have been situations in which the replacement of critical parts and machines has been almost impossible. Consequently, the proper and adequate maintenance of every tool and every piece of equipment is of prime importance under such conditions.

To offset machine breakdowns and eliminate down-time of production machinery because of parts failures, the Bell Aircraft Corp., through its Plant Engineering Department, established about seven months ago a Machine Inspection Division. This division has complete charge of machine equipment inspection, and to do this job adequately and more thoroughly has set up a "cycle inspection system." The system operates in such a manner that every machine on production is inspected thoroughly at varying frequencies, depending upon its importance to the entire production set-up and upon its fragility. With slightly more than 1700 machines in the Buffalo plant, where all production work is done, this means that every machine is thoroughly gone over about once in ten days, and such equipment as a 5000-ton hydraulic sheet metal forming press, of which there is only one in the shop, riveting machines, screw machines, and other similar equipment are inspected two, three, four, or even five times during that period.

At present, there are nine plant facilities inspectors who work under the direction of a chief inspector. Three inspectors work the first shift, three the second shift, and two work the third shift. The chief inspector, in order to keep in touch with all inspectors working on all shifts, starts before and works after his main shift work.

Preparatory to the inspection system the division made an inventory of machinery in the entire plant. Every machine and piece of equipment was identified by name, manufacturer, location in the plant, Bell Aircraft or Defense Plant Corp. number, and by details concerning the motor equipment. Also, a cycle of inspection was determined for each machine. This information was tabulated on *machine inspection record* cards, shown in Fig. 1, which are kept in a permanent file by the chief inspector. These cards were then separated into three groups, according to the type of machinery: (1) Metal cutting equipment; (2) press and forming equipment; pickle, wash, rinse, and paint tanks; compressors; and (3) conveyors, elevators, stationary lifts and cranes. No lift trucks or rolling stock are included in the inspection set-up, as this stock is serviced by the garage.

FIG. 1—A machine inspection record is made up for all of the 1700 pieces of production equipment at the Bell Aircraft Buffalo plants. The position of this card in the card file determines the cycle of inspection for each given machine. Where more frequent inspections are necessary on specific equipment, duplicate cards are made up and positioned in the file so that a card for the inspection of the specific equipment comes up on a definite schedule.

Form J1-5 MACHINE INSPECTION RECORD

DESCRIPTION _____ BELL # _____

LOCATION _____ MANUFACTURER _____ INSPECTION CYCLE _____

MAKE OF MOTOR _____ H.P. _____ VOLTS _____ CYCLES _____ RPM _____

IF TROUBLE IS FOUND, MAKE OUT PLANT ENGINEERING REQUISITION - OTHERWISE CHECK OFF LIST BELOW.

Items to be Checked	Inspection Dates												
Inspected By													

Inspection Cycles

With one card for each machine in the files, it was found difficult to maintain the desired "inspection cycles," so for those machines that must be inspected more frequently duplicate *machine inspection record* cards were made up. The plant, divided geographically into three parts according to the number of machines in each location, permitted the filing of the cards by machine location in each sector of the plant. Thus, the duplicate cards were spaced in the filing system in such a manner that as cards were removed from the front of the file, machinery to be inspected more frequently came up for inspection as desired.

Prior to the beginning of each shift, *inspection orders*, shown in Fig. 2, are made up for each inspector by machine, and 20 are given to an inspector at the start of each shift. The inspection of these 20 machines constitutes his assigned work for the day. The *inspection orders* are taken from the *machine inspection records*, beginning with the first card in the front of the file and working toward the back. These orders used by the inspector, of which there are three types according to the three groupings of the machinery in the plant, list the machine and have specific points of inspection for each machine. The inspector reports the condition of each inspection point as "good," "fair," or "needs repair." If repairs are needed, details of the trouble are

Inspections

By THOMAS E. LLOYD
Cleveland Editor, THE IRON AGE

Aid Aircraft Parts Production

. . . The plant facilities inspection system at the Buffalo parts and sub-assemblies plant of Bell Aircraft Corp. is only seven months old, but the benefits of periodically scheduled inspection of plant equipment has been one of the most vital factors in keeping production of the plant well ahead of the demand of the final aircraft assembly lines.

written on the *inspection order*, as indicated by the sample order shown in Fig. 2, an actual inspector's report. Every machine or piece of equipment, Bell or D.P.C. owned, comes under this inspection system.

At the close of each shift the *inspection orders* are turned over to the chief inspector who examines each one. When conditions of a machine warrant repairs, the chief inspector writes a *small order* requesting that repair or adjustment be made by the Maintenance Department. These *small orders*, shown in Fig. 3, are turned over to the Maintenance Department for the purpose of making the necessary repairs on the equipment and come back when the repair has been made and approved.

The *inspection order* forms are then turned over to the filing department where they are checked again, changes of location of machinery noted on the *machine inspection record* form and on inventory sheets, and then filed according to machine number, so that a complete chronological history of every machine is instantly available.

Each inspector carries a book of *machine-down-for-repairs* yellow tags and in the event that a machine must be shut down for repairs, the department foreman is consulted and a tag conspicuously placed on the machine. In such instance, the department foreman writes a *small order* for repairs and personally sends it to the Maintenance Department, where the condition and extent of repairs necessary can be explained and repair work quickly started. Before this tag, shown in Fig. 4, can be removed from the machine, an inspector checks the machine and the repairs made. When the tag is removed it is signed by the

Form PIF-10

PLANT FACILITIES INSPECTION ORDER
GROUP I METAL CUTTING EQUIPMENT

Order No. _____ Date Issued _____ Machine No. 2-24-134
Machine Name Plain Hil[illegible] Co.
Manufactured By Cincinnati Milling Mac. [illegible] Co Model No. 2-24 PL
Machine Location: Plant E'wood Dept. [illegible] Bay 13, C. Hitch

INSPECTOR'S REPORT

ITEM	CONDITION: Good	Fair	Needs Repair	REMARKS
Machine Level	✓			
Clutch And Brake	✓			USE MATCHED SETS
Belts			✓	TWO BELTS TOO LOOSE
Motors And Controls	✓			
Lubrication (Oil And Grease)	✓			
Bearings, Pivots, Etc.	✓			REPLACE VALVE HANDLE
Coolant Pump CONTROL VALVE			✓	AT COOLANT NOZZLE
Ways, Ram Ways, Table Ways	✓			
Ram Packing	✓			
Hydro System	✓			
Drive Gear Train	✓			REPLACE FIVE MISSING
Spindle, Spindle Bearings	✓			SCREWS IN ELECTRIC
Track				CONTROL BOX COVER
Quill				
Chuck				REPAIR SAFETY BUTTON
Rack And Pinion	✓			ON LOWER R.H. DOOR
Conveyor, Chain				(PAPER STUCK IN TO
Sand Paper				HOLD IT.)
Saw Guide				
Roller				
Tires				
Lubrication Oil Pump	✓			
SAFETY DEVICE			✓	
Other Items:				

Make of Motor G.E. E34-BB-2 Type or Model No. K
Phase 3 Cycles 60 H.P. 5 R.P.M. 1725

Report Checked By: L. Hilman Date: 6-13-43
Repairs Ordered By: L.H. Date: 6-13-43
Inspected By: Herb Sigert Date: 6-13-43

FIG. 2—The inspection order is given to the inspector at the start of each shift, having been filled out at the top so the inspector knows the machine, its manufacturer, number, model, and position in the plant. His report on the condition of the equipment is sent to the chief inspector who orders repairs that are necessary. These orders have different points for inspection, depending upon the group classification of the equipment. This is for Group I—Metal Cutting Equipment.

DEPT. CHGD.

PLANT ENGINEERING DEPARTMENT SMALL ORDER No. S 48281

DATE: PAYROLL ACCOUNT NO.

DESCRIPTION OF WORK (BE SPECIFIC):	TRADES	HOURS (over)	COST
	TOTALS		

MATERIAL			
DATE	REF. (over)	QUAN.	COST
TOTALS			

REQUESTED BY: MAINTENANCE DEPT. O K BY:

COMPLETED JOB ACCEPTED BY: DATE:

NO JOB COSTING OVER $25 WILL BE DONE ON THIS ORDER. FORM J1-14

FIG. 3—The front (top) and reverse (bottom) sides of the small order form are shown here. A description of the work and material required in repair, as well as date, cost of materials, time of repair, and similar pertinent information is required in filling out the card. From these records, cost of maintenance on a given piece of equipment is quickly available.

o o o

QUANTITY	MATERIAL. DESCRIPTION:	TIME CLOCK NO.	DATE	START	STOP	HOURS
	MATERIAL ACCT. NO.:					

MACHINE DOWN FOR REPAIRS No. 1 1167

MACHINE NAME MACH NO.:

DEPARTMENT NO.: LOCATION.

TIME MACHINE WENT DOWN. SHIFT: DATE:

INSPECTED BY: SHIFT: DATE:

CAUSE OF FAILURE:

P17-18

REPAIRS NEEDED:

REPAIRED BY: SHIFT: DATE:

INSPECTED BY: TIME: DATE:

JOB ACCEPTED: FOREMAN: DATE:

TIME DOWN POSTED BY: DATE:

FIG. 4—Both sides of the machine-down-for-repairs card show that very complete information is required on every machine breakdown. A yellow card indicates breakdowns as a result of normal operations while a bright red card indicates that faulty operation caused the machine down-time. These cards are affixed conspicuously to the machine while it is down for repairs.

inspector and the department foreman, and turned over to the chief inspector, who records down-time charged to machine repair.

When a breakdown is caused by misuse of a machine by an operator, a red rather than a yellow *machine-down-for-repairs* tag is attached to the machine. This is an immediate visual indication of faulty operation of a machine and has had a noticeable psychological effect on the worker. This red tag is identical to the yellow one except for color.

The immediate desirable effects of the Bell machine inspection system are genuine. Better maintained machines increase work accuracy and improve work quality, as well as reduce production costs and the number of interruptions. Less obvious but no less important are such factors as reductions in rejections and a conservation of power.

Inspectors are thoroughly trained under the supervision of the chief inspector before being placed on the job. Furthermore, each inspector works long enough in one of the three parts of the plant to become familiar with the equipment installed therein. Then, the inspectors are switched around to different sectors of the plant to assure them full knowledge of the plant equipment and they are also switched around on the type of equipment they

o o o

inspect. This latter serves the two-fold purpose of permitting them to get a better and more complete knowledge of different types of equipment and to act as a double check on one another.

In addition to inspecting just plant machinery and equipment assigned to them daily, the inspectors diligently watch for failures in other fields, such as broken concrete on the floor; bare electrical wiring; leaky air or steam lines, etc. Reports to maintenance of such faulty conditions overhead and underfoot are one of the unrecorded services of this division.

The reception of the machine inspector both by supervisory personnel in the plant and production personnel has been quite gratifying. Both workers and supervision in the plant have come to respect the efforts of the group, and by the manner in which they report mechanical troubles to the inspectors, results of their efforts continue to expand the demand for their services.

Benefits of Plan

To specifically enumerate or value the benefits derived from such a maintenance plan is practically impossible, because of the fact that there are so many variables. Operators handle machines differently; figures for the past three or six months against an equal period could not take into consideration that machines are now older; actual operating times of the machines over two such periods would not be identical; and other similar factors make such a comparison speculative at best. However, conditions that are continuously being brought to light because of periodic and regular inspection that would otherwise be unreported so long as the machine actually operated, are known to have eliminated breakdowns and long idle periods. Workers are reluctant to report machinery or equipment defects because first, it may mean some time off and, second, the blame might be laid to them. Foremen and lead men of departments have too many other things to remember than to make periodic check-ups and file reports on the condition of the machines under their direction.

One of the more indirect but probably most important benefits derived from scheduled inspections of machinery and equipment with proper record keeping is a chronological history of each machine. At a glance, it can be determined from the *inspection order* file just how frequently repairs had to be made on an individual machine. and by cross reference to the small order card file, the cost of these repairs can be determined. Thus, if and when the time comes to curtail operations of plant equipment, the most costly equipment can be disposed of or shut down.

Likewise, with much of the equipment in the plant owned by the Defense Plant Corporation, if Bell Aircraft Corp. decides in the future to own all equipment in its plants, D.P.C. owned equipment can be better evaluated by reference to the service records of each individual piece of machinery.

Furthermore, frequently charges of down-time on a machine are made against maintenance, whereas the cause of the down-time could be lack of material or other reasons not traceable to maintenance. This is eliminated entirely because on the *machine-down-for-repairs* tag is shown the time the machine went down, when it went back into production, and the net down time. This information is also immediately available whenever desired.

All in all, the Bell Aircraft system of machine maintenance has been highly satisfactory. Generally, such a system would mean a lot of tedious paper work, but in this instance such is not the case. This system has been devised to make the handling of the system as easy as possible, eliminate forgetfulness of shop or inspection personnel, and to expedite the carrying through of repairs and maintenance. Furthermore, sloppy repair and maintenance work resulting from the necessity for speed is eliminated because every repair must be inspected immediately after completion. Inspectors also find themselves acting as liaison officers between management and worker, bettering worker morale, and, consequently, bettering production. The inspector is the man who makes each set-up man, each foreman and each worker understand the monetary value of the machine in the shop; the money value of idle time; the special part each person plays in the whole production set-up of the plant. This has had an intangible but noticeable effect even in the short space of seven months that the plan has been in operation.

All told, the benefits of periodic and supervised machine inspection are quite substantial. As pointed out, it is impossible to evaluate them on the basis of dollars and cents, but they are none-the-less recognizable. In the present war effort, much has been asked of everyone and especially the aircraft industry. The elimination of break-downs in production machinery is more than just economical—it is also the manufacturer's patriotic duty.

Welding Booth Curtains Made Fire Resistant

GLYCERINE is an important constituent in the preparation of coatings for making a substitute for asbestos cloth used as curtain material for electric welding booths. According to the report of the European investigator, P. F. Abramovich (*Avtogennoe Delo 12, No. 5*) fabric is fireproofed by saturating it with a 20 per cent solution of ammonium phosphate, drying and coating with three layers of a mixture containing:

Milk casein	100 parts
Water	400 parts
Glycerine	130 parts
Ammonia solution, 25%	10 parts

Intermittent drying periods are necessary between the application of each layer. Periods of 8 to 12 hr. are needed if drying is done at room temperature, but the time may be shortened if higher temperatures are used. If 500 parts of water glass (sodium silicate, sp. gr. 1.35-1.40) is added to the above mixture after homogenizing, the preliminary saturation with ammonium phosphate can be omitted. Thin or transparent fabrics can be made opague by adding 30 to 50 parts of zinc oxide or soot to the above mixture.

Protective curtains obtained by the use of this procedure were found to be somewhat more resistant than curtains of fireproof tenting canvas also subjected to suitable impregnation.

Anthracite Pig Iron

By RALPH H. SWEETSER

. . . Anthracite coal as a blast furnace fuel progressed very rapidly from 1836 when Dr. F. W. Geissenhainer first used it successfully until 1875 when the tonnage of bituminous (coke and raw coal) pig iron surpassed that made with anthracite. Here the author outlines the history of anthracite as a metallurgical fuel and gives the reasons for its decline. With the correction of the fallacious ideas as to anthracite blast furnace practice, the writer looks forward to a renewed interest in the use of anthracite coal.

ANTHRACITE pig iron once dominated the entire iron and steel industry of this country; and for two decades, from the year 1855 until 1875, anthracite was the prevailing blast furnace fuel. Since World War I, however no anthracite pig iron has been made. The practice of using anthracite mixed with coke as blast furnace fuel continued sporadically, even up to recent years when the coke shortage became excessive. The last recorded use of anthracite as blast furnace fuel mixed with coke was in 1923, when a total of 12,730 tons of anthracite was used. During the winter of 1933-34 a limited percentage of "broken" anthracite was successfully used as blast furnace fuel mixed with coke in the production of ferromanganese. Under such conditions the story of anthracite pig iron in the United States can be only historical. It might, however, be prophetic.

The superiority of charcoal pig iron over coke pig iron is generally conceded; the superiority of anthracite pig iron over coke pig iron will probably be admitted when all the comparative results are studied. The late Dr. Richard Moldenke* placed anthracite pig iron next to charcoal pig iron as to quality for foundry practice.

**"Round Table: Carbon in Pig Iron," A.I.M.E. annual meeting, February, 1927.*

Anthracite ceased to be a blast furnace fuel in this country for two reasons: First, because of its increased cost, and second, because the practice at anthracite blast furnaces remained frozen as it was during the Centennial year of 1876. Neither one of these reasons detracts from the intrinsic value of anthracite as a blast furnace fuel; both causes can be corrected. It is not only possible but probable that anthracite, properly selected and sized will again be used as blast furnace fuel, successfully and economically, in modern blast furnaces with adjusted practice.

In a previous article† the history of the production of pig iron in this country was divided into four distinct blast furnace fuel eras: Charcoal period from 1645 to 1855; anthracite period from 1855 to 1875; bee-hive coke period from 1875 to 1919, and by-product coke period from 1919 to the present.

†*Ralph H. Sweetser, "Blast Furnace Fuels: Their Regional Influences,"* THE IRON AGE, *Nov. 29, 1934.*

Naturally there was considerable overlapping of these fuels into the next era, and charcoal has continued all through the years and is still used as blast furnace fuel, but during each of the four eras listed above more pig iron was made from the predominating fuel than from all the others combined. Raw bituminous coal flourished only a short time as a blast furnace fuel; the first raw coal furnace being built in 1845 and the last in 1887, a total of 70 small blast furnaces.

Geographic Distribution of Furnaces

From the time of the erection of the first anthracite blast furnace, the "pilot plant" of Dr. Geissenhainer, in 1836 until the last new anthracite blast furnace in 1891, 275 anthracite furnaces were built. Naturally Pennsylvania led the list with 192 furnaces; and New York and New Jersey came next with 46 and 25 furnaces respectively. The anthracite furnaces were distributed as follows:

Pennsylvania	192
New York	46
New Jersey	20
Maryland	8
Massachusetts	3
Wisconsin	3
Connecticut	2
Michigan	1
Total	275

The peak production of anthracite pig iron was 2,186,411 gross tons in 1890 which was 23.76 per cent of the total production of 9,202,703 tons for that year; there were 173 anthracite furnaces on the active blast furnace list of that year.

The statistics of the iron industry at the time of the introduction of anthracite as a blast furnace fuel are somewhat uncertain, and although the building of the No. 1 furnace of the Crane Iron Co. at Catasauqua on the Lehigh River just above Allentown, Pa., is generally accepted as the start of the first commercially successful anthracite blast furnace, other anthracite blast furnaces had been built and blown in before the blowing in of the Crane furnace on July 4, 1840.

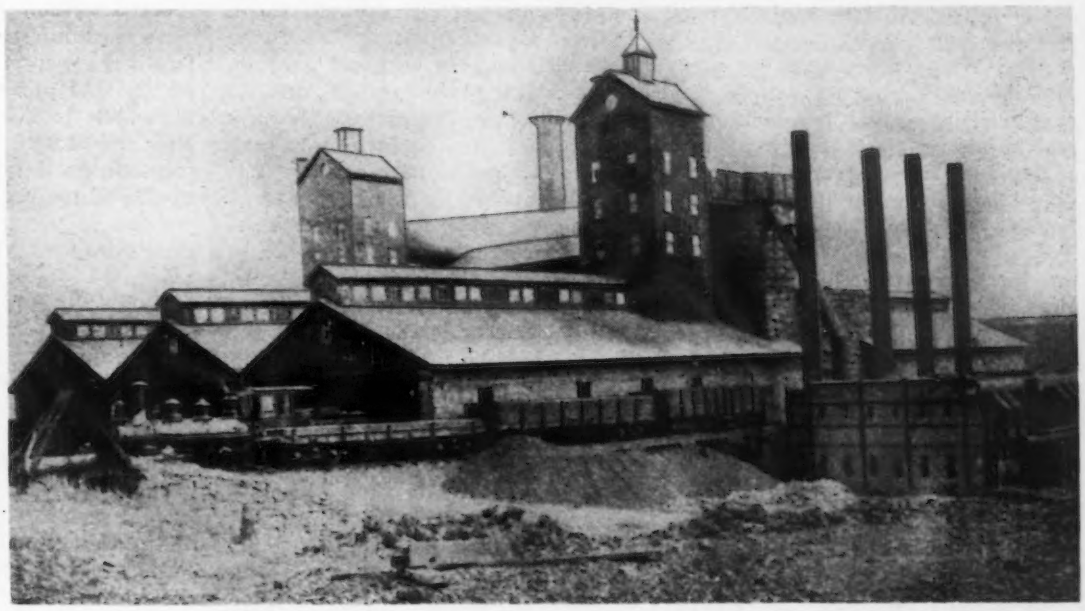
It is not the purpose of this article

to reconcile the various reports on the erection of the first anthracite blast furnace, but it does seem reasonable to accept the record of the first 11 blast furnaces as published in the year 1841 by Walter R. Johnson who claimed to have gathered the data directly, but he does not include the Silver Creek furnace, temporarily operated by Dr. Geissenhainer in 1836, and who died shortly thereafter. All the early anthracite blast furnaces were built four-square as is shown in the lower part of the Alburtis furnace, Fig. 1. Of course the recorded heavy weight of air per ton of pig iron was not delivered into the furnace, because of leakage.

o o o

FIG. 1—View of the 60-ton No. 7 and No. 8 blast furnaces of the Thomas Iron Co. at Alburtis, Pa. The No. 7 furnace was the last in this country to use 100 per cent anthracite as blast furnace fuel. At the right can be seen the cast iron pipe stoves for the hot blast with one downcomer bringing gas to the stoves and another downcomer opposite taking gas to the boilers. These furnaces illustrate the four-square design used for all early anthracite blast furnaces.

o o o



Most of the anthracite was transported by canal boats; and that was the general tempo of the anthracite pig iron industry. A change in the burden would "come down" day after tomorrow; the blowing in of an anthracite blast furnace was an anxious operation of two or three days. Sick furnaces and "furnace doctors" were standard practice.

In spite of the slow driving of the anthracite blast furnaces of the middle of the 19th century the building of anthracite furnaces went ahead faster than the building of coke blast furnaces. "Prior to 1854 only 22 coke blast furnaces had been built, compared to 77 anthracite furnaces."† In his book "The Manufacture of Iron," published in 1854, Frederick Overman said, "But few blast furnaces work coke in this country . . . as there is but little prospect of an addition to the number of coke furnaces which now exist, we shall devote but a limited space to this subject." In 1855 the total pig iron made with coke and raw bituminous coal was only 55,705 tons compared with 340,951 tons of anthracite pig iron.

In the eight years which began in 1850 and ended in 1857 there were 83 new anthracite blast furnaces built in this country; none was built during the next two years. During the 10-year period of 1870-79, inclusive, more new blast furnaces were built in this country than in any other decade, as follows:

	Number of Blast Furnaces
Charcoal	68
Anthracite	75
Raw coal	24
Coke	79
Total	246

It was during this decade, in 1875, that the production of "bituminous" pig iron (coke and raw coal) passed that of anthracite pig iron. The records show that there were 713 blast furnaces on the active list, 147 coke furnaces and 37 raw coal furnaces compared with 236 anthracite furnaces and 299 charcoal blast furnaces.

Although anthracite was first successfully used by Rev. F. W. Giessenhainer of New York in his Valley furnace on Silver Creek, near Pottsville. Pa., in 1838, it had no continuing commercial use as a blast furnace fuel until 1840 when David Thomas of Wales started the blast furnace of the Crane Iron Works at Catasauqua, Pa. The valleys of eastern Pennsylvania, in the heart of the anthracite region and near the local iron ores and the magnetites of New Jersey, became the most active of the 10 iron producing centers of the United States. John Peter Lesley, secretary of the American Iron Association, said in his book published in 1859, "Eastern Pennsylvania and northeastern Maryland is the greatest iron region in the Union, 98 anthracite and 103 charcoal furnaces and 117 forges (none of which last produce iron from the ore)."

The momentum gathered by the Lehigh Valley, Schuylkill Valley, Susquehanna Valley and northeastern Maryland in the days of anthracite still influences the steel industry at Bethlehem, Conshohocken, Steelton and Sparrows Point. The blast furnace practice of that region permeated all the other iron sections of this country and went into the iron and steel centers of the whole world, but was gradually speeded up from the slow pace of anthracite practice.

Anthracite Pig Iron Quotations

Although anthracite pig iron dominated the iron and steel industry of this country, in actual tons produced, from the year 1855 until 1875, its predominance in the Philadelphia pig iron market lasted longer and extended from the year 1850 until the end of 1889. Up to and including the year 1849 market quotations for pig iron in Philadelphia were for charcoal pig iron only, but in the reports of the American Iron and Steel Association—Annual Statistics of the Iron Trade—for 1890 is the following note: "After 1849 the standard of quotations was No. 1 anthracite pig iron hereafter given;" therefore from the

year 1850 to 1889 inclusive, the caption on the column for pig iron prices read as follows: "Average prices per gross ton No. 1 anthracite foundry pig iron at Philadelphia." In one of James M. Swank's annual statistical reports of the American Iron and Steel Trade, he uses the caption "No. 1X anthracite foundry pig iron at Philadelphia." Beginning with the year 1890 the caption read "average monthly prices of No. 1 foundry pig iron at Philadelphia." Thus the controlling influence in the pig iron market had passed from anthracite to coke pig iron.

After 1906 another quotation crept into the market report on pig iron at Philadelphia, and a column with the caption, "No. 2 foundry pig iron at Philadelphia" appeared. For the year 1906 the average price of No. 2 foundry was 80c. a ton below that of No. 1 foundry. In 1907 the spread was 75c. a ton and in 1908 and thereafter, it was 50c. a ton.

The expressions "No. 1," "No. 1X" and "No. 2X" show that the quotations were made during the period when all foundry and mill pig irons were graded and sold "on fracture"; which was not such a "rule-of-thumb" method after all when the foundryman had a particular kind of casting to make. The metallurgical history of the iron and steel industry can be followed quite accurately by reading the market quotations for iron and steel products. One finds that 150 years ago the quotations were for charcoal pig iron; 100 years ago it was "No. 1 anthracite foundry pig iron" and "cut nails by the 100-lb. kegs." "Best rolled bar iron" was quoted in 1844; iron rails in 1847; and steel rails in 1867. (This digression from the subject of anthracite pig iron is due to the romance of iron and steel compressed into meticulous reports of the late James M. Swank when he was secretary of the American Iron and Steel Association, which was organized March 6, 1855, in Philadelphia.)

Blast Pressure with Anthracite

"The use of anthracite as a blast furnace fuel is a striking illustration of the cumulative grief that comes from false theories and lack of scientific facts." This statement was made on page 146 of the author's book, *Blast Furnace Practice* (New York, 1938) and is repeated here for the sake of emphasis. The erroneous belief that "anthracite requires three and a half times the quantity, velocity and density or compression of a blast necessary and proper for charcoal, and as much greater than for coke in the proportion of three and a half to two and a half" started in the wording, as here quoted, in the original patent granted to Friederich W. Geissenhainer, Dec. 19, 1833, for his "new and useful improvement in the manufacture of iron and steel by the application of anthracite coal."

In any consideration of the comparative volumes and pressures of the air blast for charcoal, coke and anthracite used as blast for charcoal, coke and anthracite used as blast furnace fuels, it must be remembered that the blast furnace men of a century ago had never used anything but charcoal in their furnaces. The change from charcoal, the best and most reactive of all blast furnace fuels, to anthracite, the densest and hardest of all blast furnace fuels, was such a jump in blast furnace practice that the advocates of anthracite had to go to Wales to get a man to operate the first commercially successful anthracite furnace plant. One charcoal iron operator was so skeptical that he told David Thomas he would eat all the pig iron that he could make with anthracite. It is interesting to note that the men who put up the money for those early anthracite blast furnaces were mostly merchants, professional men, bankers and wholesale grocers; *not* the charcoal pig iron producers. (As then, so now, it is men outside the steel industry who are advocating direct reduction of iron ore to make sponge iron.)

It is true that both coke and anthracite as blast furnace fuels require more air blast in volume and pressure than does charcoal but not in the proportions stated by Dr. Geissenhainer in his patent application in 1833, and repeated in practically all the literature on the subject up to World War I, and not refuted until 1935 (Trans. A.I.M.E. 1935, "Blast Furnace Fuels — Anthracite Coal," Ralph H. Sweetser).

To show how a false theory can be built up and can adversely affect blast furnace practice and permeate the literature on both sides of the Atlantic, the case of the blast furnace at Pine Grove, Pa., will be briefly told here. In Vol. VIII of the Transactions of A.I.M.E., 1879-80, John Birkinbine, an outstanding authority on iron ores and pig iron of that period, wrote the story of his unique experience at the Pine Grove furnace, where he was forced to use successively charcoal, beehive coke and anthracite as fuel in a little charcoal furnace 36½ ft. high with a 9 ft. 4 in. diameter bosh; the charcoal gave out in February, and beehive coke was used until the coke strike in April when all anthracite was used for a while, and then 55 per cent anthracite and 45 per cent beehive coke. There were three tuyeres to this tiny furnace with a total tuyere area of 47.7 sq. in., when using charcoal in February, 1879.

The ore was very lean, only 38.26 per cent yield in pig iron, using 2531 lb. charcoal and 2287 lb. limestone per ton (2260 lb.) of pig iron. The blast pressure was only 0.77 lb. and the temperature 600 deg. F. at the rate of 1896 cu. ft. per min. and 77.8 cu. ft. air per lb. of fuel. The production was 95 tons a week.

Now comes the penalty of false theories. When coke was used nozzles were put into the tuyeres, and the total area was cut from 47.7 to 28.9 sq. in.; the pressure went up to 1.0 lb. and it took 2435 cu. ft. air per min. and 92.6 cu. ft. per lb. of fuel; the tonnage dropped to 70 tons per week, and the fuel jumped to 3494 lb. per ton of pig iron. Following the same false theory the tuyere area was cut to 14.7 sq. in. when anthracite was used; the pressure went to 4.75 lb. and it is recorded that it took 103 cu. ft. air per lb. of fuel, and the production dropped to 58 tons per week. This is the performance reported by Sir Lowthian Bell in his "Principles of the Manufacture of Iron and Steel," London, 1884, but he left out such a seemingly trifling matter as the throttling of the tuyeres down to less than one-third of the size when using charcoal. That false theory persisted throughout the 19th century and was one of the contributing factors to the abandonment of anthracite as a blast furnace fuel.

Kreisinger (Bureau of Mines, Technical Paper 137, p. 54) found that anthracite required only 95.6 per cent as much air for combustion as coke.

The author has found in practice that it requires approximately the same volume of air to burn anthracite as to burn coke in the same blast furnace.

One of the reasons advanced for the supposedly higher blast pressures with anthracite than with coke is that anthracite is "entirely lacking in cellular structure and is accordingly of much greater density, so that the ratio of surface exposed per unit of weight is only a small fraction of what it is in the case of coke and only a proportionately small amount can be burned per sq. ft. of hearth area. This means that the output of a given furnace is necessarily much smaller when supplied with anthracite than with coke" (J. E. Johnson, Jr., "Principles, Operation and Products of the Blast Furnace"). The author has found that in the case of anthracites suitable for blast furnace fuel as soon as there is any combustion on the surface of a lump of anthracite a

rough gray-black surface appears. This roughening of the smooth surface is the reason why anthracite is so combustible, and is a phenomenon that is little known.

Anthracite Blast Furnace Lines

The "lines" of anthracite blast furnaces were very bad; everything was wrong except that the diameter of the stockline was greater than the diameter of the hearth at the tuyere level. Again, false theories brought a series of troubles that never ended during the period of anthracite blast furnaces, in spite of the fact that Edward Walsh, Jr., of St. Louis, called attention to the bad shape of anthracite blast furnaces and pointed out the remedy in his very progressive paper entitled, "Irregularities of the Blast Furnace Process and a Practical Way to Avoid Them," in Transactions A.I.M.E., Vol. XV, 1886-87, page 419 et seq. Walsh mentions the fact that "The Transactions of the Institute bear witness to the prevalence of scaffolds causing irregularities of working, especially under the conditions of modern American practice." He says further on page 429, "From all the evidence the conclusion is inevitable that the blast furnace does not efficiently perform the duty demanded of it, chiefly for the reason that it does not furnish a constant supply of fuel to be acted upon by a regularly measured volume of air delivered into the furnace, by the engine through the tuyeres . . . the cause of the deficient or intermittent supply of fuel before the tuyeres can be attributed to an interruption of the downward delivery of the solids by the formation of adhesions, scaffolds, excrescences, or some other form of obstruction on the boshes or the furnace walls. In the forms of furnaces heretofore used, and now in use, it will be seen that the conditions favoring the formation of such adhesions to the boshes or furnace walls always prevail. . . . The authorities generally and very properly locate the commencement of the scaffold or the lower portion of it in the upper portion of the zone of fusion. But to locate it more exactly it is necessary to note that these adhesions will commence to form immediately above the zone of complete fusion. They cannot occur lower as the temperature is sufficiently high to preclude the possibility of the furnace, in a normal working condition, containing anything but incandescent fuel with drops or pellets of molten iron or slag on their way to the crucible. . . . Hence it may be concluded that the more narrow within certain practical limits the furnace shaft is constructed, the more thorough and the more energetic the actions of reduction and carbon impregnation will be; consequently the better the materials will be prepared to be received in the zone of fusion."

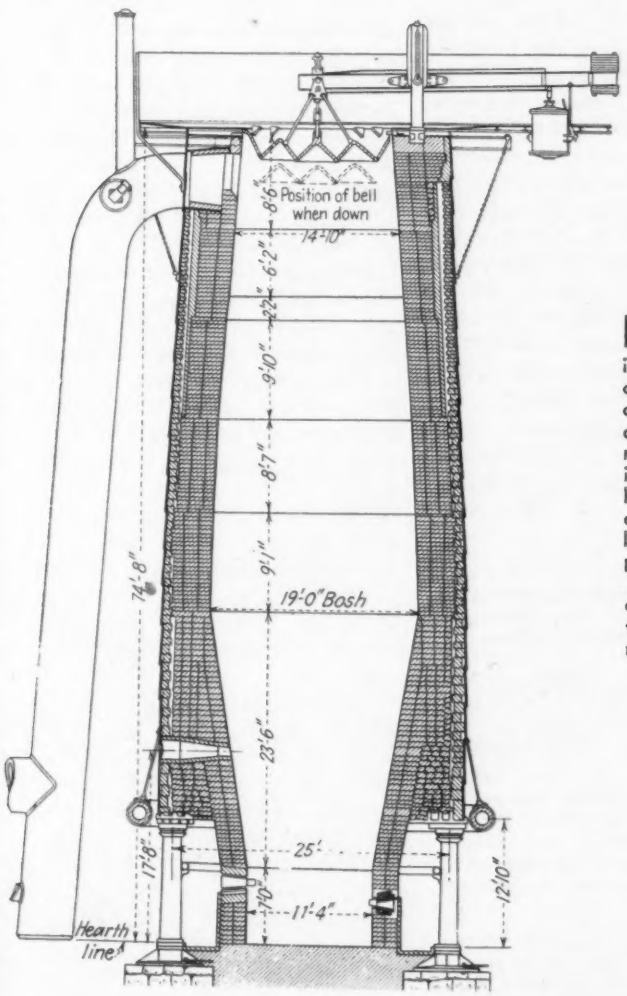


FIG. 2—Section of the Durham furnace showing the peculiar shape and high bosh of the anthracite blast furnace of the period. This furnace was first blown in in 1876. This furnace had a working volume of 13,237 cu. ft. but its largest daily output reported in 1894 was only 105 tons. This bosh angle is strictly modern; the height of bosh is nearly three times too high.

Walsh shows a vertical cross-section of his proposed new lines, with low bosh and a slim, "more narrow," shaft, which looks quite modern and has proved to be correct. Some small charcoal blast furnaces had adopted the design with marked success, but "the anthracite practice had discarded it." The Antrim Iron Co.'s charcoal blast furnace at Mancelona, Mich., 60 ft. x 11 ft., built in 1887-88, and rebuilt in 1912, has lines similar to those suggested by Walsh and has long demonstrated the correctness of it by a record of tonnage and fuel consumption commensurate with its working volume.

The anthracite blast furnaces had very high boshes, large shaft volume, flat bosh angle, small hearth diameter, and small blast volume. These ideas, based on false theories, were so firmly fixed in the minds of the anthracite blast furnacemen, that when they went to other parts of the country, as many of them did, they carried the same erroneous designs with them. For instance, the four blast furnaces built by the Maryland Steel Co. at Sparrows Point, Md., in 1889-93 had furnace lines with large boshes so high up in the shaft that the blue print could be read upside down as well as right side up, as far as the diameters and shapes of hearth, bosh and stockline were concerned. The fine rich concentrates of the Cranberry iron ore mine in North Carolina were sold and only the lean lump ore was smelted in the blast furnace at Johnson City, Tenn., because the directors from the Lehigh Valley believed that fine ore closed the voids between the big lumps of ore and limestone. It took many years of coke practice to overcome the errors of anthracite practice; meanwhile the anthracite blast furnaces died.

Durham and Warwick Furnaces

In Transactions XIV, page 833, John Birkinbine said "The best anthracite blast furnace practice recorded in our Transactions is conceded to be that pursued by Mr. B. F. Fackenthal, Jr., at the Durham Furnace

and Mr. Edgar Cook at the Warwick Furnace."

The blast furnace at Durham owned by Cooper and Hewitt was first blown in in 1876. This furnace was fully described by B. F. Fackenthal, Jr., in his article entitled "Durham Blast Furnace," Transactions A.I.M.E. Vol. XIV, 1885-86. This blast furnace had a "working volume" of 13,237 cu. ft. and even with 2400 lb. per ton of pig iron it should have made about 325 tons of pig iron per day instead of only 105 tons, which was its largest daily average reported in 1894.

The peculiar shape and the high bosh of the anthracite blast furnace of that period are shown in Fig. 2. Although the iron ore mix contained over 55 per cent iron yet "owing to the siliceous Duham ores it required 59.42 per cent limestone or 2495 lb. per ton of pig iron." In one blast of the furnace it required 2765 lb. of fuel "including blown-in week."

Mr. Fackenthal describes the two Morris up-right blowing engines as "entirely too small for the capacity of the furnace" and which could not run over 26 rev. per min., limiting the air to 16,000 cu. ft. a min. It will be seen from Fig. 2 that the bosh angle was very steep for those days, and if the bosh had been lowered to about 10 ft. above the tuyeres, this furnace would have been "more narrow" according to the suggestion of Edward Walsh in 1886 mentioned previously. According to the record the blast temperature was 960 deg. F. and 9.6 lb. pressure, and it required 88.76 cu. ft. of air (piston displacement) per lb. of fuel. Sometimes the furnace used all anthracite but most of it was 81.25 per cent anthracite and 18.75 per cent Connellsville coke.

The Warwick Furnace was one of the most successful of the anthracite furnaces but it had a long series of "dirt troubles" and other irregularities which were very frankly described by the manager, Edgar S. Cook. This little furnace, running on all anthracite, had only 5500 cu. ft. capacity and made a little over 70 tons (2268 lb.) per day, using 2884 lb. of fuel with 45.9 per cent iron ore. In commenting on Birkinbine's article in Transactions regarding the operation of Warwick Furnace, W. J. Taylor of Chester, N. J., compared the work of the Warwick Furnace on anthracite with that of the Isabella (Pittsburgh) Furnace on coke, using a 56 per cent iron ore. Taylor said Isabella was making one ton of pig iron for each 68.2 cu. ft. of capacity and producing 220 tons per day, while the Warwick Furnace with 50 per cent ore, was making 1 ton of pig iron on 70 cu. ft. capacity.

About 10 years ago the president of one of the largest anthracite companies investigated the possibilities of again using anthracite as a blast furnace fuel; his company had much anthracite suitable for blast furnaces, and in times past had supplied many furnaces of eastern Pennsylvania and New Jersey with their entire requirements. The first question he asked of his consultants was "Why was anthracite discontinued as a blast furnace fuel?" One man who had had much experience with anthracite and coke said that "the reason for the change from anthracite to coke was twofold: One, because of the price, and the other, because of the more rapid combustion of coke over anthracite, and consequently a greater production of iron." This man then quoted Forsythe in his book, "The Blast Furnace and the Manufacture of Pig Iron," where he says on page 71 that coke offers considerably more surface to the action of the blast and its rate of combustion is two to two and a half times that of anthracite coal. This statement has since been disproved.

Then the following statements made in 1918 by the late J. E. Johnson, Jr., in his book, "Principles, Operation and Products of the Blast Furnace," were given:

> "Anthracite has three disadvantages as a blast furnace fuel when compared to coke: First, it is entirely lacking in cellular structure and is accordingly of much greater density. Second, it has a tendency to spall or decrepitate under the action of heat, this spalling seems to produce a tendency to scaffold the furnace.
>
> "Third, the much greater density of the fuel as compared with coke reduces the volume of the fuel charge very greatly. The increased density of the charge means increased resistance to the blast.
>
> "As a consequence of these three conditions anthracite furnaces are characterized by slow driving and small outputs, high pressure and a strong tendency to become scaffolded, and work irregularly. These are the technical conditions, which, joined with the commercial considerations above outlined, have caused the decline of anthracite as a blast furnace fuel."

Granting that anthracite prices have been higher than coke, there are now places near the magnetite deposits of New York, New Jersey and Pennsylvania where the delivered price of furnace coke is higher than the delivered price of egg size anthracite.

The above three technical disadvantages do not now apply to present blast furnace practice as might be applied to anthracite, and the two reasons stated in the third paragraph of this article still hold good.

Technical Phases of Anthracite

The technological progress in the preparation of iron ores, and in the combustion of fuels since the days of anthracite blast furnaces has been so great that the disadvantages mentioned by Forsythe and Johnson no longer exist. It must be remembered that both these very able blast furnace men and authors wrote their books (and in both cases, died shortly thereafter) before the discovery of the combustion zones in front of the tuyeres, before the discovery of the close sizing of coke, before the discovery of the extra cost of pig iron for each extra one per cent of ash in the coking coal, and before the fine crushing, magnetic concentration and sintering of the magnetic iron ores of New York and New Jersey, contiguous to the anthracite region of Pennsylvania.

There are certain points in the use of anthracite as blast furnace fuel that cannot be cleared up completely until someone uses egg anthracite in a modern blast furnace, but we may be sure that much of the legendary and recorded high blast pressure of anthracite compared with coke was due to the throttling down of the tuyere nozzles, thus putting so much back pressure on the flap valves of the blowing engines that not only did the pressures go up, but it also looked as though it actually took more air per lb. of anthracite than per lb. of coke.

Another contributing factor to the alleged disadvantage of anthracite as compared with coke was the confusion in the minds of blast furnace men and physical chemists regarding the definitions of "combustibility" and "reactivity" of fuels. The generally accepted definition of the "combustibility" of blast furnace fuel is the rate of complete gasification in front of the tuyeres. In the case of anthracite, which is twice as heavy as coke, there must be delivered twice as much air for the same bulk, as for coke.

The definition of "reactivity" as given by Keene, Turner and Scott in their paper, "Reactivity of Anthracite with Carbon Dioxide" (Trans. A.I.M.E. Vol. 108, 1934, pages 303-323) is the amount of carbon dioxide reduced to the monoxide under comparative conditions. These three research men found that the reactivity of anthracite was about midway between charcoal and byproduct coke; the reacting power for charcoal being 95, for anthracite 51 to 61 (six kinds of anthracite were tested), and for two cokes 11 to 18. The initial reaction temperature of anthracite 1061 deg. F., is lower than that of

byproduct coke which is 1319 deg. F.

It would seem that coke with all its pores would present a surface more conducive to the reduction of CO_2 than the smooth surface of anthracite. In discussing the phenomenon with P. H. Royster, formerly of U. S. Bureau of Mines, he remarked in his characteristic terse way, "a gale of wind would have very little effect on a man who stepped off the street into a doorway, while the man in the street would be blown off his feet."

The disadvantage of anthracite because of its tendency to decrepitate when exposed to heat was the cause of much "dirt trouble" in some of the old anthracite blast furnaces, but in certain others there was no such trouble, just because certain anthracites are not suitable for blast furnace fuel and others are. Therefore, it is necessary to test all anthracites that are being considered as blast furnace fuel. The causes of decrepitation of anthracite in varying degrees have not been fully determined; some decrepitate, and some do not.

Advantages of Anthracite

Dr. H. J. Rose, senior industrial fellow, Anthracite Industries Fellowship, Mellon Institute of Industrial Research, Pittsburgh, is a leading authority on anthracite and its uses. At the February, 1941, meeting of the Eastern States Blast Furnace and Coke Oven Association he presented a paper on "Pennsylvania Anthracite as Metallurgical Fuel." Dr. Rose said, in part, "Anthracite is a hard, strong, natural fuel, which is available in a wide variety of closely screened sizes. It is non-caking and shows absolutely no tendency to soften, even when heated under heavy load. It has a higher heating value than coke of the same moisture and ash content, and is available with low sulphur and phosphorus percentages."

Rose calls attention to the advantage of the high alumina (30 to 38 per cent) in the ash of anthracite, especially in these days of washed ores where the gangue is highly siliceous. In speaking of the reactivity of anthracite he says:

> "One of the false theories which has plagued anthracite is the belief that it is a slow-burning fuel. Apparently most people take it for granted that a compact and concentrated fuel like anthracite will be slower burning than a porous fuel like coke.
>
> "Actually, anthracite is *more* reactive than metallurgical coke at low and moderate temperatures. This has been conclusively proved by different investigators in a variety of ways. Under the high-temperature conditions which exist in front of the tuyeres of a blast furnace, it can be confidently stated on the basis of both experimental evidence and theory that either anthracite or coke will be converted into carbon monoxide in front of the tuyeres of a blast furnace *just as fast as air is supplied.* Furthermore, each fuel will require the same amount of air per lb. of carbon burned at the tuyeres. At these high temperatures the reactions between carbon and oxygen are so extremely fast that it is the rate of air supply and not the chemical activity nor texture of the fuel which determines the number of pounds gasified per min.
>
> "English investigators have shown that no appreciable amount of blast actually passes through coke pieces unless they are smaller than about ½ in. in size. If one breaks open pieces of coke that have passed through a furnace, it will be seen that the oxidized or partially burned zone in the coke penetrates only about ⅛ in. If one breaks open pieces of anthracite which have passed through a furnace or cupola, it will be found that oxidation has penetrated just about the same distance into the anthracite!"

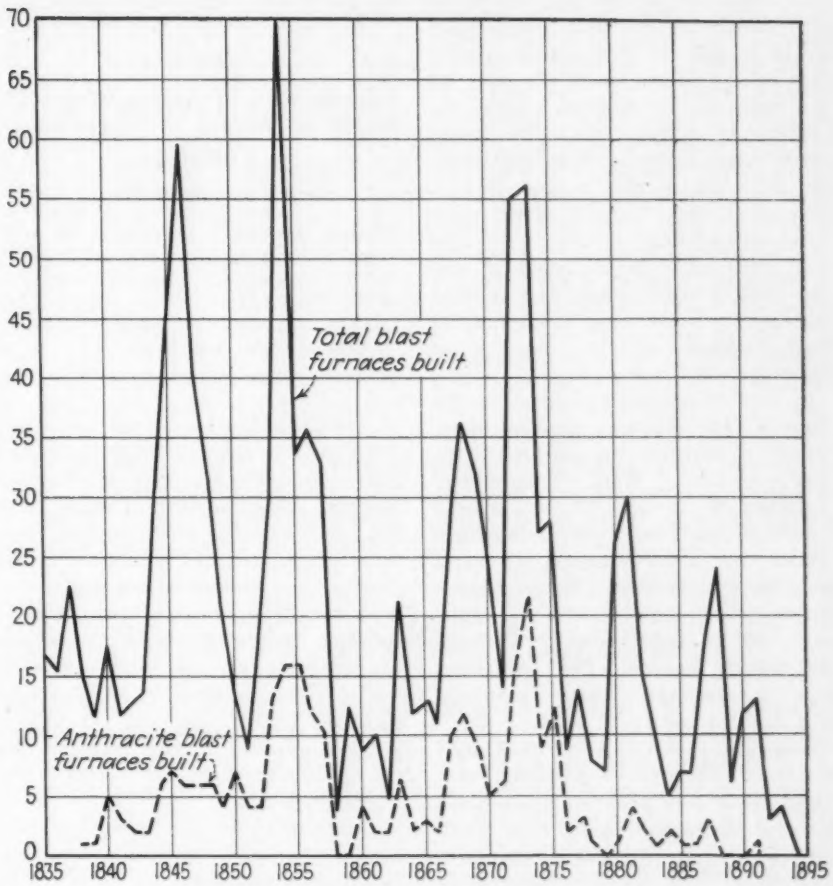


FIG. 3—Number of charcoal, anthracite, raw coal and coke blast furnaces built each year from 1835 to 1895 compared with the number of anthracite furnaces erected during the same period. Compiled from the 10th census, American Iron Association and other sources

In a previous article (Trans. A.I.M.E., 1935, "Blast Furnace Fuels—Anthracite Coal" by R. H. Sweetser) the author called attention to the advantage of the endothermic reaction of anthracite in the top of a blast furnace in that it will take heat from the surrounding materials, thus cooling the top gas to a greater extent than coke can cool it. The volatile matter in anthracite helps to enrich the waste gas giving it a higher calorific value than waste gas from a coke furnace.

The early anthracite blast furnaces used anthracite alone in the fuel charge; gradually Connellsville coke was mixed with the anthracite in varying proportions. The Thomas Iron Co. at Hokendauqua, Pa., used anthracite entirely as blast furnace fuel from its start in 1854 up to the spring of 1889 when Connellsville coke was mixed with the anthracite. This innovation was started by David Thomas, a grandson of the original David Thomas from Wales, who built up the anthracite pig iron industry in this country. This practice of mixing the two fuels became general throughout the anthracite furnace regions, and is the reason for the difficulty in now obtaining analyses of pig iron which was definitely made with all-anthracite fuel.

The last blast furnace in this country to run on 100 per cent anthracite was the No. 7 blast furnace of the Thomas Iron Co. at Alburtis, Pa., which ran on 100 per cent anthracite during the month of January, 1914. A good view of this blast fur-

nace, alongside its twin furnace, is shown in Fig. 1. The cast iron pipe stoves for the hot blast are seen at the right of the picture, with one downcomer bringing gas to the stoves, and another downcomer on the opposite side taking gas to the boilers. This small two-furnace plant, with a capacity of only 60 tons a day for each, was so well balanced in design that it often made pig iron at less cost than the more modern skip-filled furnaces of the company at Hokendauqua.

In 1915 when the president of the Thomas Iron Co. was unable to negotiate a contract for anthracite in sizes smaller than "steamboat" (through 7 in., on 4⅜ in., round holes), he had the brick lining torn out of the stone stack and put a complete steel shell, from hearth jacket to top-ring inside the stone stack, 60 ft. high with 13 ft. bosh and 8½ ft. hearth. The new lines were streamlined when compared with the former 16-ft. bosh.

When the 1888 Directory of American Iron and Steel Association was issued there were about 60 small blast furnaces in Pennsylvania, New York and New Jersey still using anthracite exclusively, the other "anthracite furnaces" (about 129 of them) used a mixture of anthracite and beehive coke, mostly from Connellsville.

The anthracite used was "lump" which had no upper limit for size and was "on" a 7 in. round hole. The very smallest piece of such big coal would have less than half as much surface as an equal weight of the largest pieces of "egg" coal. The increase of surface for combustion of the anthracite when the smaller sizes are used is shown in Table I.

For reasons previously shown it has been hard to obtain analyses of pig irons which were surely made with 100 per cent anthracite; most of the anthracite pig iron was made with a mixture of anthracite and coke. In a private letter J. Norman Sherer, vice-president, Thomas Iron Co., in October, 1933, writes there were many "carbon analyses of pig iron with a percentage of anthracite coal in the fuel unit," which were collected in our study of the effects of anthracite on the total carbon in pig iron. Mr. Sherer said, "The four analyses of Oct. 26, 1887, I believe we are safe in saying were of pig iron produced from 100 per cent anthracite as fuel."

Unfortunately the complete analyses of these pig irons were not recorded in the letter.

In 1914 a cast of IX pig iron from the same furnace was analyzed and tested as follows: Silicon, 3.28 per cent; phosphorus, 0.76 per cent; titanium, 0.272 per cent; carbon, 3.52 per cent; sulphur, 0.032 per cent; manganese, 0.74 per cent; vanadium, 0.41 per cent. Ultimate strength was 20,370 lb. per sq. in., and the fuel was all coke.

At the same time a cast of iron from one of the Alburtis furnaces running on half anthracite was tested and found to have an ultimate strength of 26,620 lb. per sq. in. This was No. 2 plain iron with 1.90 per cent silicon, 0.04 sulphur, 0.668 phosphorus, 0.94 manganese, 0.209 titanium, 0.046 vanadium, and 3.52 carbon.

TABLE II

Four Analysis of Anthracite Pig Iron Made in the No. 1 Hokendauqua Furnace

Grade	Combined Carbon, per cent	Graphite Carbon, per cent	Total Carbon per cent
IX	0.400	3.417	3.817
2X	0.442	3.106	3.548
2	0.733	2.846	3.579
GF*	0.600	2.912	3.512

* Gray forge, or "mill iron".

Anthracite Pig Iron Production

The recorded tonnages of anthracite pig iron produced each year from 1868 to 1923 inclusive are given on pages 10 and 11 of the Annual Statistical Report for 1931 published by the American Iron and Steel Institute, and are given in "gross tons" of 2240 lb. (much of the anthracite pig iron was shipped on a 2268-lb. ton to take care of the "sandage").

The production figures from 1854-67 inclusive were reliably kept by John Peter Lesley, secretary of the American Iron Association. There is a gap of 15 years, however, previous to 1854, when the tonnages made with each kind of fuel, (charcoal, anthracite, coke) are uncertain even though the total annual tonnages of pig iron, for eight out of the 15 years, are reported by William B. Phillips in Mineral Industry, page 278, for 1892. Lesley in his Iron Manufacturers Guide, 1859, reported 115,000 tons of pig iron produced in 1849 with anthracite.

TABLE III

Anthracite Pig Iron Produced in the United States

	Gross Tons
1838—Probably 18 weeks	70
1839—Probably 25 weeks	500
1840—Probably 25 weeks	2,000
1841 to 1853 inclusive, partly estimated	1,340,000
1854 to 1923 inclusive, reliable	64,904,700
Total	66,247,270

Although this total is recorded as "anthracite" pig iron, it is likely that only one-third was strictly "all anthracite" iron, and the rest made with a mixture of anthracite and beehive coke.

Conclusion

Whether or not Pennsylvania anthracite will again be used as blast furnace fuel depends upon two unpredictable factors, one is the mental attitude of the operators and miners, and the other is the financial factor which at present is so uncertain.

The present anthracite producers are almost wholly domestically minded, and are concerned commercially and in their research work with the problems of heating space in buildings in competition with liquid and gaseous fuels. This mental attitude must be changed before an-

TABLE I

Anthracite for Blast Furnace Fuel Screened over Round Holes Coal in Spheres

Size	Through, In.	On, In.	Maximum Area, Sp. In.	Maximum Volume, Cu. In.
Lump	No limit	7		
Steamboat	7	4⅜	153.940	179.59
Broken	4⅜	3¼	60.133	43.847
Egg	3¼	2 7/16	33.183	17.974
Stove	2 7/16	1⅝	18.666	7.5829

Size	Minimum Area, Sq. In.	Minimum Volume, Cu. In.	Maximum Ratio, Area to Volume	Minimum Ratio, Area to Volume
Lump	153.940	179.59	....	0.857
Steamboat	60.133	43.847	0.857	1.371
Broken	33.183	17.974	1.371	1.846
Egg	18.666	7.5829	1.846	2.461
Stove	8.2957	2.2468	2.461	3.692

thracite can be restored as a metallurgical fuel. Possibly the miners themselves, in their research work for finding new markets may find out what the New York Lutheran minister discovered 110 years ago; namely, "the application of anthracite coal exclusively or in part, in deoxidating and carbonating iron ore."

The financial factor relates to the cost of egg size anthracite compared with the cost of blast furnace coke delivered to blast furnaces in the territory of the magnetic iron ore regions contiguous to the valleys of the Hudson, Delaware, Schuylkill and Susquehanna Rivers. The cost of blast furnace coke involves the erection of coke ovens, the transportation of about 1½ tons of coking coals per ton of blast furnace coke, and the cost of refining the byproducts. To offset these extra capital and operation costs, which do not apply to anthracite, there will be credits for products which will reduce the cost of coke, and the steel plant will have the coke oven gas for fuel unless it is sold at better prices to a public utility. All these items will require the most skillful kind of cost accounting to determine the true cost of each fuel delivered to the same furnace plant, and will require a careful balancing of conditions in each individual case.

The above comments apply strictly to Pennsylvania anthracite of which "gigantic reserves are still available," according to Allen J. Johnson's paper, "Anthracite as a Domestic Fuel," presented at the Columbus, Ohio, meeting of A.I.M.E., in October, 1933. Johnson said that, "one reliable estimate places these reserves at 10 billion short tons of recoverable coal."

What has been said about the technical phases of anthracite and the advantages of anthracite applies not only to Pennsylvania anthracite but to anthracite from other parts of the world, some of which the author has found to be of the highest grade for blast furnace fuel.

In the future use of anthracite as a blast furnace fuel, the size will be egg; coke of the same size may, or may not, be mixed with the anthracite.

Effect of Oxygen Enriched Blast on Coke Combustion

REPORTING in *Archiv für das Eisenhüttenwesen* on their investigation of the combustion of coke with oxygen-enriched blast, R. Durrer, P. Lwowycz and B. Marincek observed that increasing the proportion of oxygen in the blast promoted the reduction of carbon dioxide to carbon monoxide.

In previous experiments, R. Durrer had noted that when coke was burned with pure oxygen there was a considerable amount of carbon dioxide in the products of combustion. This was explained by the theory that the quantity of gas formed was too small to raise the temperature of the surrounding zone to a point sufficiently high for reduction of the primary carbon dioxide to carbon monoxide to take place.

In subsequent investigations which resulted in findings contrary to the original observation a small shaft furnace about 8 in. in diameter with two tuyeres, was used with coke with 1.1 per cent ash and blast in which the proportion of oxygen was 21 per cent, 42 per cent, 66 per cent and 100 per cent in different tests.

The rate of CO_2 reduction to CO was found to depend greatly on the temperature, other conditions being equal. The reaction rate in the first stage, that of CO_2 formation, is slower with air than with oxygen enriched blast. A high initial temperature has a greater effect on the reduction of CO_2 than a steep temperature drop.

The experiments indicate that it would be possible to operate a low-shaft furnace with an air blast the gases from which would consist of only nitrogen and carbon dioxide. Full scale tests would be necessary, however, to test the smelting efficiency of such a furnace. One advantage would be that a cheap fuel of low physical strength would be able to support the reduced weight of the burden.

There seems to be no practical way of obtaining complete combustion of all the carbon, so that a mixture of carbon monoxide and carbon dioxide must be counted on. An increased proportion of the former means a higher fuel consumption in the furnace, but the flue gas would have a higher calorific value.

If a burden requiring 750 kg. of coke to produce 1000 kg. of pig iron in an ordinary blast furnace were used in a low-shaft furnace, the carbon required to produce 100 per cent CO in the flue gas would be about 1500 kg. per ton of pig iron and this would need 1200 cu.m. oxygen, to which the ore would contribute about 300 cu.m. The blast would therefore have to supply about 900 cu.m. of oxygen per 1000 kg. of pig iron, thereby adding to the cost of production.

Desulphurizing Pig Iron with Acid Slags

THE formation of gaseous silicon sulphide is responsible for only a small proportion of the strong desulphurizing effect which acid slag has at 3090 deg. F., W. Oelsen and H. Maetz claim in *Archiv für das Eisenhüttenwessen* as a result of laboratory tests using melts in graphite crucibles.

The greater part of the desulphurization is effected by the initially acid slag only after the iron has taken up a large amount of silicon (over 4 per cent, which makes the iron of little commercial use) and the final slag after desulphurization of the iron. Prolonging the reaction time increases the silicon content of the iron, thus increasing the basicity of the slag and causing the sulphur content of the iron to be reduced to a very low point. Compared with the amount of sulphur removed from the iron by the final slag, the amount removed in the gas phase which may run to 30 per cent of the total sulphur is quite small. This slag may, for example, reduce the sulphur content from 0.6 per cent to 0.01 per cent.

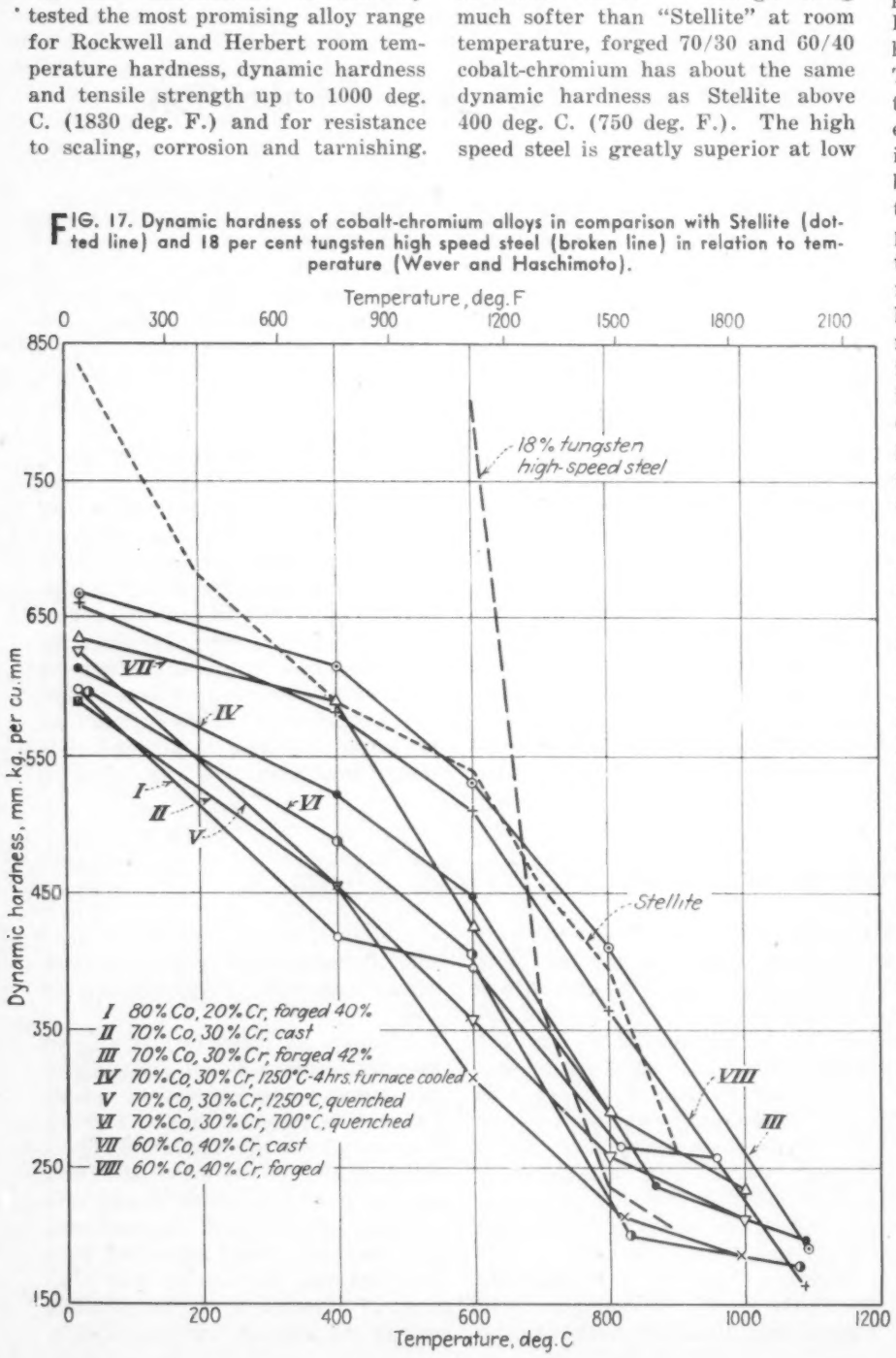
Reducing the quantity of acid slag lowers the degree of desulphurization considerably. However, decreasing the silicon in a small quantity of acid slag increases basicity to a greater extent than with a large quantity of slag.

Titanium additions to acid slag at high temperature do not act as a flux but increase the amount of silicon passing into the iron, thus making the slag more basic and improving desulphurization. Of the added titanium, only a small proportion remains in the slag at the high temperatures used and very small quantities pass into the iron. It is quite likely that most of it remains on the crucible wall in the form of titanium carbide.

Dynamic Hardness Testing at

(E) DYNAMIC HARDNESS AT ELEVATED TEMPERATURE OF COBALT-CHROMIUM ALLOYS IN COMPARISON WITH HIGH SPEED STEEL AND STELLITE: After establishing the cobalt-chromium constitutional diagram by thermal, microscopic and X-ray analysis, Wever and Haschimoto[22] exhaustively tested the most promising alloy range for Rockwell and Herbert room temperature hardness, dynamic hardness and tensile strength up to 1000 deg. C. (1830 deg. F.) and for resistance to scaling, corrosion and tarnishing. The dynamic hardnesses of 80/20, 70/30 and 60/40 cobalt-chromium are compared in Fig. 17 with those of Stellite and "commercial 18 per cent tungsten high-speed steel." Chromium raises the dynamic hardness. The hot forged samples yield particularly favorable results. Although being much softer than "Stellite" at room temperature, forged 70/30 and 60/40 cobalt-chromium has about the same dynamic hardness as Stellite above 400 deg. C. (750 deg. F.). The high speed steel is greatly superior at low and medium temperatures[2,18,19], but it becomes softer than Stellite and most cobalt-chromium alloys around 675 deg. C. (1245 deg. F.).

FIG. 17. Dynamic hardness of cobalt-chromium alloys in comparison with Stellite (dotted line) and 18 per cent tungsten high speed steel (broken line) in relation to temperature (Wever and Haschimoto).



The loss of tensile and yield strength is less pronounced than that of dynamic hardness between room temperature and 600 deg. C. (1110 deg. F.), but this condition is reversed at higher temperatures (Figs. 17 vs. 18). The authors offer no explanation for this peculiarity. It appears that the effect of strain hardening is eliminated in the cobalt-chromium tensile bars at the higher temperatures due to the slow breaking speed of 5 mm. per min. In the dynamic hardness tests, the resistance to plastic deformation includes the effect of work hardening. The great dynamic hardnesses at extreme temperatures readily explain the difficulties encountered in the forging and cogging of commercial radio alloys containing up to 50 per cent cobalt and the necessity for applying small deformations and slow deformation speeds.

(F) DYNAMIC HARDNESS OF LOW- AND HIGH-ALLOY NICKEL-CHROMIUM STEELS, STELLITE AND STELLITE SUBSTITUTE ALLOYS WITH LOWER STRATEGIC METAL CONTENT: The latest word on dynamic hardness testing comes from the German Institute for Aeronautical Research,[23,24] which has greatly improved Walzel's swinging pendulum machine.[16] The test piece, which now remains in the furnace, is firmly anchored in a massive, water-cooled anvil whose steel horn is completely scale resistant up to 1100 deg. C. (2010 deg. F.). The furnace and anvil rest on a sturdy table provided with a dovetail groove and are shifted laterally by a hand wheel for making several tests in succession. Fig. 19 shows the electric furnace rolled back and exposing the sample for dynamic testing. The machine can also be used for notch-impact testing (10 meter-kilogram unit).

A conversion curve is established by testing a great variety of ferrous and non-ferrous materials dynamically with 5 and 10 mm. (below 100 Brinell) cemented carbide balls and statically in the Vickers and Brinell

Elevated Temperatures

By ERICH FETZ

. . . This concluding section of a two-part article deals with dynamic hardness at elevated temperatures of cobalt-chromium alloys in comparison with high speed steel and Stellite; the hot hardness of low and high-alloy nickel-chromium steels, Stellite and Stellite substitute alloys with lower strategic metal content; dynamic hardness of brass, bronze and copper-aluminum with rising temperatures, etc.

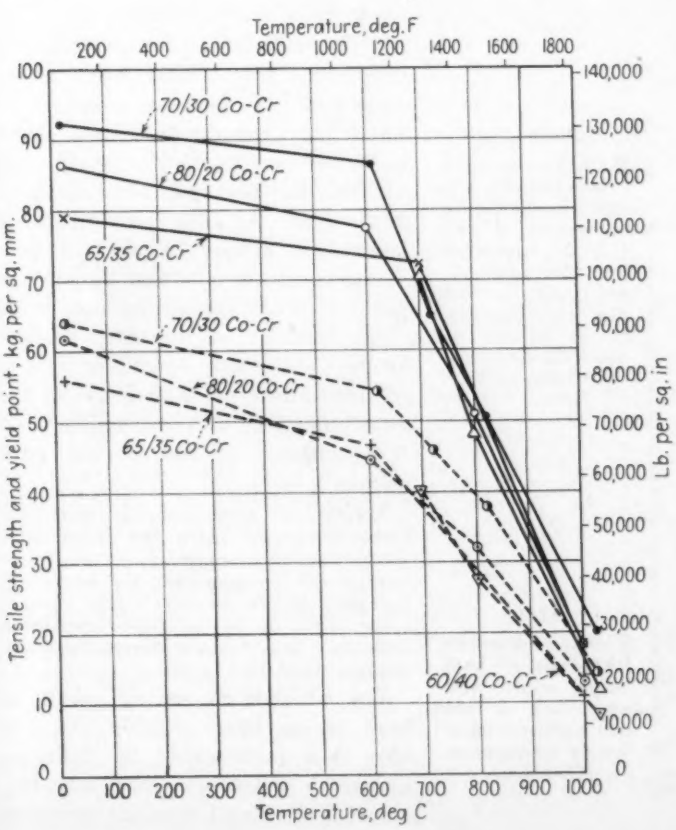
machines. The dynamic indentations are thus converted into Brinell units. Cornelius and Trossen fail to explain why the ball impressions of cold-worked copper, duralumin and mild steels fall far off the conversion curve. It appears that the rebound energy has not been determined. The cold worked materials thus appear to be harder, because a greater portion of the dynamic energy is consumed in a higher rebound instead of in producing a larger indentation.

Fig. 20 shows the rate of softening of Stellite facings on austenitic valve steel, of a hardened low-alloy nickel-chromium-tungsten steel, and of two austenitic chromium-nickel steels containing additions of tungsten, tantalum and columbium. At 900 deg. (1650 deg. C.) the Stellites still show a remarkably high hardness. The results on the low-alloy steel[3,16] and on 18/8 (Fig. 4) agree with previous findings on similar material.

A novel application of dynamic hardness testing is shown in Fig. 21, which traces the precipitation hardening of a solution annealed 1.5 per cent copper-bearing iron at 450 deg. and 500 deg. C. (840 deg. and 930 deg. F.) without removing the sample from the furnace. Room temperature tests would furnish qualitatively the same information but are no quantitative measure of the actual hardness at elevated temperatures.

Cornelius[34] recently reported on a comprehensive research aiming at a substitution for cobalt in hard facings on airplane engine valves. The three standard Stellites 1, 2, 3 in Table VII are compared with 24 substitute alloys of lower strategic metal content. The testing methods applied imitated either conditions in fabrication (determination of melting range, behavior in welding, sensitivity to cracking when being welded, ground and polished) or conditions in service (dynamic hardness up to 900 deg. C. (1650 deg. F.), structural stability at 900 deg. C., resistance to scaling in air and gasoline combustion gases, thermal expansion, tendency toward cracking due to abrupt changes in temperature).

Cornelius chose the dynamic hardness test because it is "simple and results in stresses resembling at least remotely the stresses to which the hard facing deposits are exposed whenever the valve closes." Two beads were laid down on top of each other on a chromium-nickel-tungsten steel, most commonly used for exhaust valve bodies of German aero engines. Analysis range: 0.4 to 0.55 per cent car-

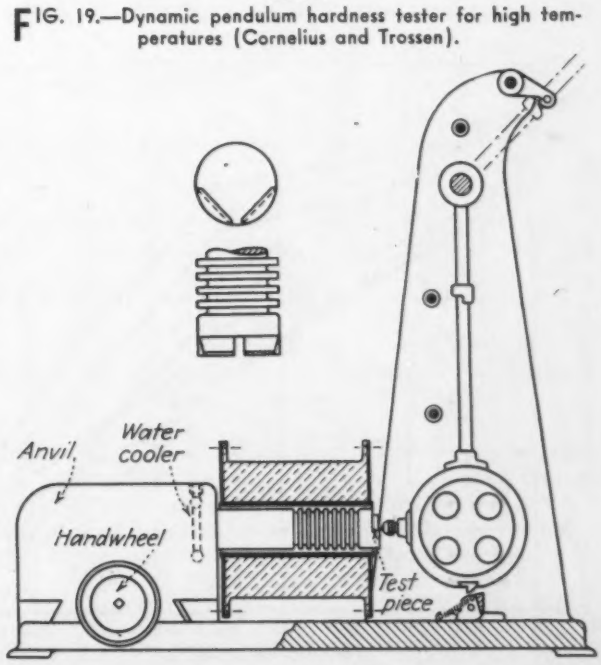


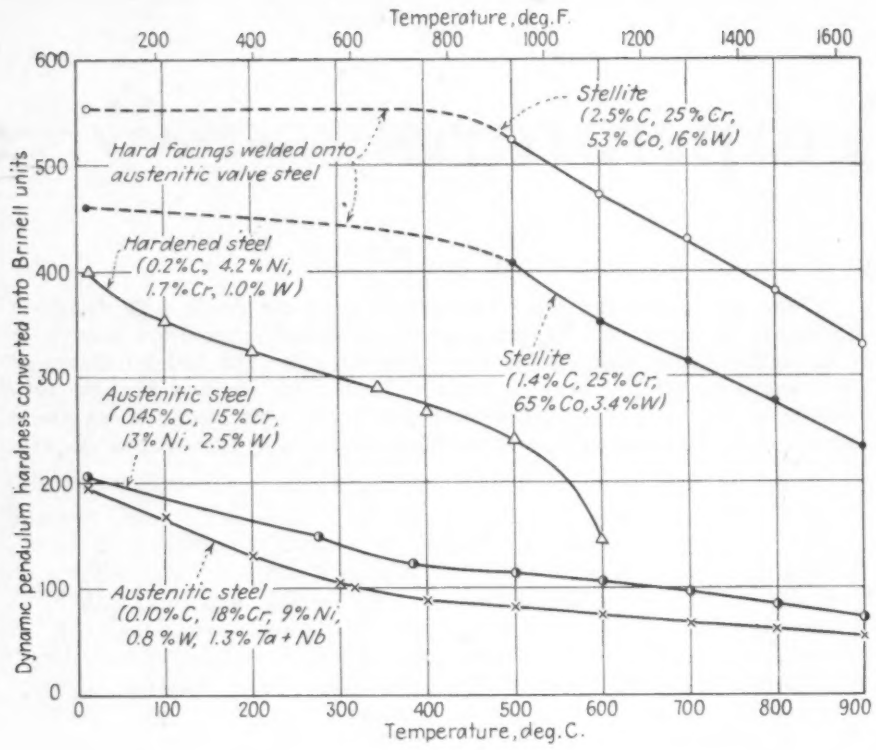
LEFT

FIG. 18.—Tensile strength and yield point of cobalt-chromium alloys in relation to temperature and chromium-content (Wever and Haschimoto).

BELOW

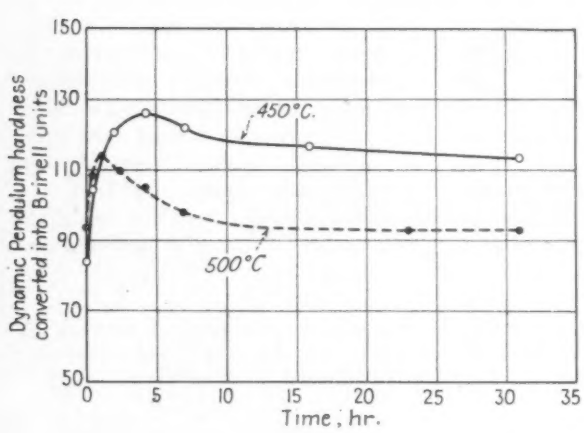
FIG. 19.—Dynamic pendulum hardness tester for high temperatures (Cornelius and Trossen).





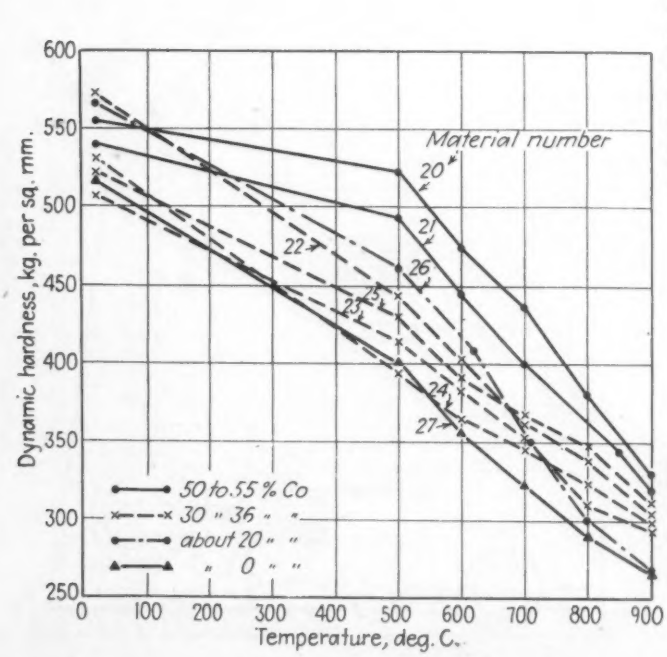
ABOVE

FIG. 20.—Dynamic hardness of low and high-alloy nickel-chromium steels and of hard facings made of Stellite (Cornelius and Trossen).



UPPER LEFT

FIG. 21.—Dynamic hardness of a precipitation-hardening iron-copper alloy (1.5 Cu) quenched from 850 deg. C. and aged at 450 deg. and 500 deg. C. in relation to time (Cornelius and Trossen).



LEFT

FIG. 23 — Dynamic hardness of hard facing alloys with more than 2 per cent carbon in relation to temperature (Cornelius).

bon, 1.2 to 1.5 per cent silicon, 0.6 to 1.0 per cent manganese, 14 to 17 per cent chromium, 12 to 15 per cent nickel, 2 to 3 per cent tungsten.

Figs. 22 and 23 show the dynamic hardness repectively of the low- and high-carbon facing alloys in relation to temperature. Obviously, the high cobalt content is chiefly responsible for the great red hardness of Stellite. Carbon and tungsten also exert a strong influence on the hot hardness (Fig. 22 vs. 23). Molybdenum increases it more effectively than tungsten (Alloys 14, 15, 16), while vanadium is a poor substitute for tungsten (Alloys 11 and 13). A carbon content of 2 per cent plus 10 per cent tungsten (Alloy 24) is required to equal the hot hardness of Stellite No. 1 if half of its cobalt is replaced by iron. Alloys 4 and 10 and the low-cobalt Alloy 14 attain the red hardness of the softest of the three conventional Stellites. Alloys 5, 6 and 9 also have a sufficient red hardness. A gamma matrix insures a high dynamic red hardness. In changing to the alpha state, Alloy 17 softens markedly above 600 deg. C. (1110 deg. F.).

A great red hardness is only one of several desirable properties of hard facing alloys. The results of *all* tests are evaluated in Table VIII. Alloys 8 and 7 are rejected because of insufficient red hardness although they do pass all other tests. Alloys 17 and 11 are also too soft and lack other qualities to a certain extent.

The compositions recommended as substitutes for exhaust valve faces, seats and stem ends are presented in Table IX. The cobalt content of 61 to 65 per cent in the previously used Stellites has been cut down to 25 to 28 per cent. An alloy containing even less cobalt, namely 19 per cent, possesses favorable qualities, but its application is discouraged because of its "high content of imported molybdenum." (German conditions!) The modified alloys permit the use of the more plentiful ferro-chromium and ferro-tungsten in lieu of the pure metals.*

** Although price considerations become immaterial when the safety of a military airplane engine is at stake, we may briefly mention that the newly developed "Ersatz-Stellites" are cheaper since cobalt is by far more expensive than iron and because ferro-alloys are cheaper than pure metals.*

The problem of saving cobalt in hard facing alloys (Table IX) has also been investigated by Schmidt, Lamarche and Kauhausen,[35] who employed a Rockwell machine provided

with a chromium-plated tungsten carbide ball.

An attempt has been made in Figs. 24 to 26 to compare the softening rates of three similar alloys with 65, 34 and 19 per cent cobalt tested dynamically by Cornelius and statically by Schmidt and co-workers. The latters' Rockwell hardnesses have been converted into (static) Brinell numbers for purposes of comparison. The per cent loss of room temperature hardness at 700 deg. C. (1290 deg. F.), given in brackets, is in no case the same for both testing methods. Furthermore, there are differences between both hardness curves at lower temperatures. At higher temperatures *all* hardness curves must, of course, converge toward zero at the melting point. Incidentally, Figs. 22 and 23 also show a much greater spread in hardness at 500 deg. C. (930 deg. F.) than at 900 deg. C. (1650 deg. F.). Since the dynamic and static hardness tests were not made on identical alloys and because Cornelius does not state whether the rebound energy has been taken into account, no further conclusions shall be drawn from Figs. 24 to 26. Incidentally, the same softening rates were found for Stellite in mutual indentation and (static) Monotron hardness testing.[35]

The service conditions prevailing in an elastically deformed valve would probably be most closely imitated in the dynamic *rebound* hardness test. However, this method involves such experimental difficulties at elevated temperatures as to become impractical. The dynamic *indentation* hardness test remains first choice, particularly so if the elastic properties are determined by measuring the rebound energy.

As early as 1918, two French metallurgists, Guillet and Godfroid,[19] called attention to the phenomenally high dynamic hot hardness of Stellite (55.6 per cent cobalt, 33.6 per cent chromium, 9.5 per cent tungsten, 1.48 per cent carbon, 0.17 per cent silicon). In the meantime, their findings have been largely confirmed ([2, 18, 22, 23, 34]) on Stellites of widely varying composition tested for dynamic hardness by investigators who seem to have been more or less interested in a metallurgical curiosum. The application of the dynamic hardness tester by Cornelius served a grim, urgent, practical purpose, i.e., to alleviate the shortage of vital strategic metals in one of the most important implements of modern warfare. The success in eliminating those compositions which are serviceable from all viewpoints excepting red hardness and whose application would thus have resulted in failure, constitutes a strong argument in favor of the dynamic hardness testing method.

TABLE VII

Composition of Stellites and Substitute Alloys Tested for Dynamic Hardness by Cornelius

(Figs. 22 to 26)

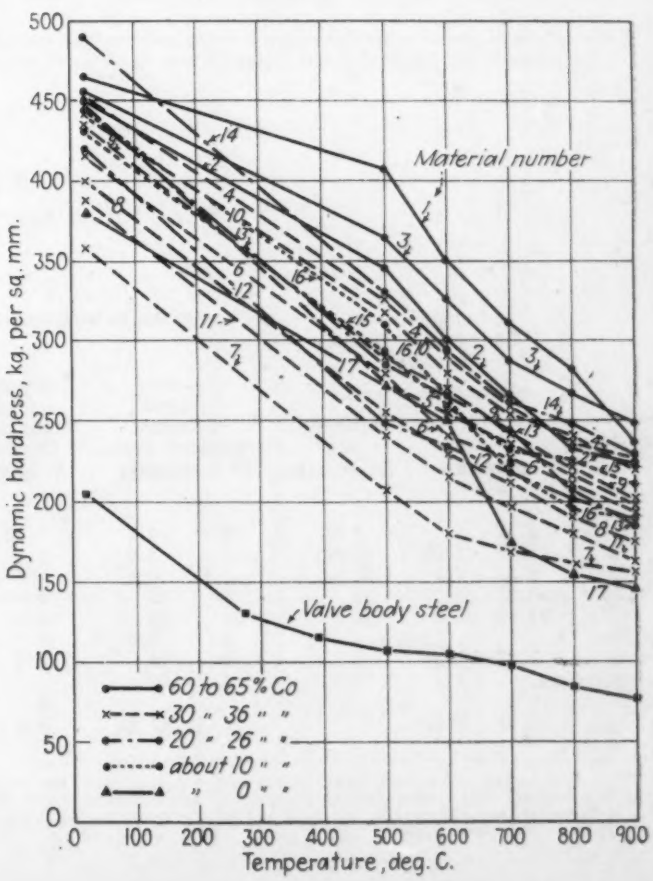
No.	% C	% Si	% Mn	% Co	% Cr	% Mo	% V	% W	% Fe
1	1.40	n. d.	n. d.	65.32	24.64	.....	.....	3.43	1.56
2	1.30	2.52	0.30	61.74	26.54	.....	.....	3.76	3.07
3	1.16	1.17	0.39	60.91	26.8	.....	.....	7.58	1.11
4	1.87	2.08	0.49	36.2	26.1	.....	.....	3.5	29.76[1]
5	1.38	2.88	0.36	34.1	26.48	.....	.....	5.46	29.34[1]
6	1.43	2.41	0.60	34.0	25.95	.....	.....	3.65	31.96[1]
7	1.19	2.17	0.21	33.64	22.94	.....	.....	3.48	35.72
8	1.28	2.95	0.59	33.54	26.46	.....	.....	3.70	30.16
9	1.48	2.15	0.45	31.43	25.15	.....	.....	6.78	32.58[1]
10	1.68	1.76	0.56	30.4	27.75	.....	.....	5.36	32.49[1]
11	1.40	2.90	0.42	30.3	26.3	.....	3.1	.....	35.58[1]
12	1.60	2.90	0.41	25.8	27.0	.....	.....	3.45	38.84[1]
13	1.87	2.18	0.85	24.8	23.4	0.85	2.1	0.86	43.09[1]
14	1.60	2.33	0.64	19.25	26.9	4.55	.....	3.96	40.77[1]
15	1.49	2.10	6.68	11.36	26.05	4.4	.....	.....	47.0
16	1.34	1.91	0.75	10.3	27.5	4.36	.....	.....	51.4
17	1.10	1.82	0.31	1.3	24.2	.....	.....	3.33	65.72
20	2.46	0.35	0.21	55.23	25.40	.....	.....	16.02	0.77
21	2.90	1.43	0.22	49.42	26.44	.....	.....	13.80	5.05
22	2.78	1.48	0.40	35.9	27.9	.....	.....	13.5	18.04[1]
23	2.99	1.34	0.38	33.6	28.2	.....	.....	8.4	25.09[1]
24	2.05	1.90	0.44	29.7	27.08	.....	.....	14.9	23.93[1]
25	3.00	1.95	0.46	29.4	28.56	.....	.....	8.4	26.21[1]
26	2.44	1.35	0.41	19.58	27.17	.....	.....	12.93	33.34[1]
27	4.17	1.51	6.80	0.38	29.38	.....	.....	0	57.53[1]

[1]) Calculated as balance.
n.d.= not determined.

o o o

FIG. 22 — Dynamic hardness of hard facing alloys with less than 2 per cent carbon in relation to temperature (Cornelius).

o o o



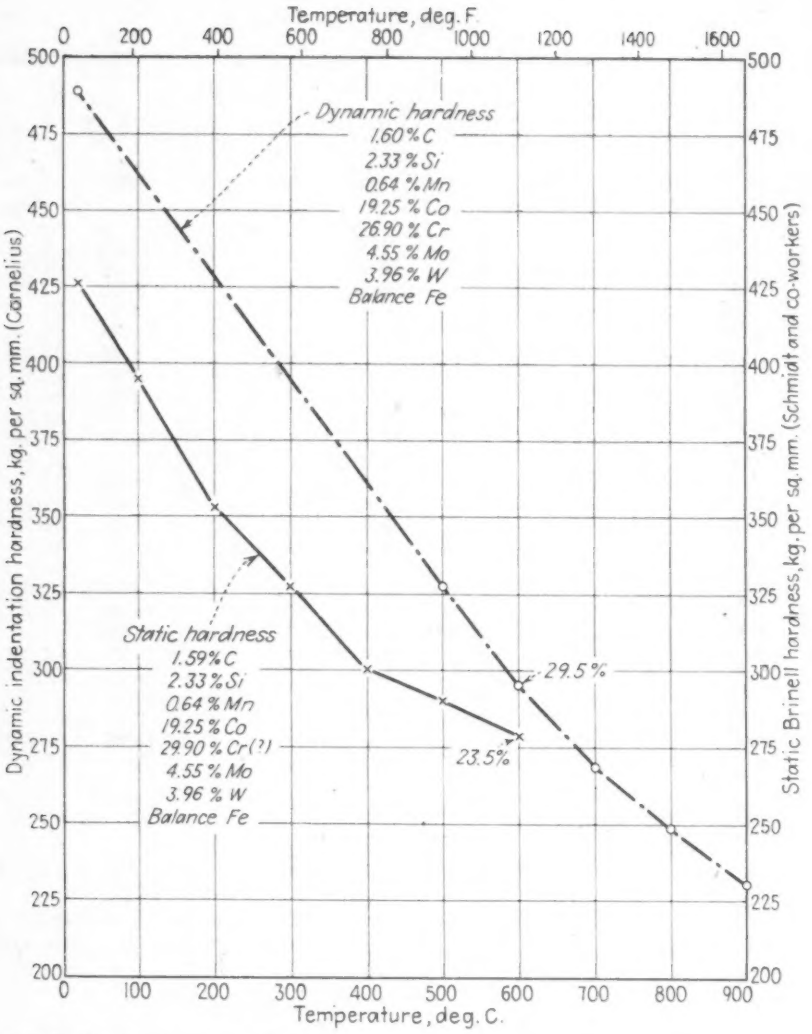


FIG. 24—Softening of a low-cobalt hard facing alloy as determined by dynamic (Cornelius) and static hardness tests (Schmidt and co-workers) at rising temperatures.

(G) DYNAMIC HARDNESS OF BRASS, BRONZE AND COPPER-ALUMINUM AT RISING TEMPERATURES: Edwards and Herbert[3] heated copper-zinc alloys to 875 deg. C. (1607 deg. F.) and determined their dynamic hardness in the furnace on cooling. The indentation diameters are plotted against temperature and are also converted into Brinell units H by means of the relationship found by Edwards and Willis[24] to exist between dynamic and static tests

$$H = 7455/d^3$$

In the alpha phase range, the hardness drops but little up to 600 deg. C. (1110 deg. F.) (Fig. 27). While alloys containing more than 36 per cent zinc are considerably harder than those lower in zinc up to 450 deg. C. (840 deg. F.), this position is reversed at and above 600 deg. C. (1110 deg. F.). The marked changes of "plasticity"—as the authors prefer to call the dynamic hardness—is attributed to the beta constituent and to its thermal critical point at 470 deg. C. (880 deg. F.).

Brass containing 43.16 per cent zinc has a much greater "plasticity" at 600 deg. C. (1110 deg. F.) providing it has been cooled to that temperature from 850 deg. C. (1560 deg. F.) rather than if the temperature has been raised from below 450 deg. C. (840 deg. F.) due to the delay in dissolving excess alpha (Fig. 28). Once dissolved on heating, alpha does not reappear until the temperature has fall-

TABLE IX
Hard Facing Alloys and Substitutes

Element	Composition of Conventional Stellites According to		Alloy Range Investigated by		Alloys Suggested as Substitutes by			
					Cornelius			
					Valve Seats and Faces		Valve Stem Ends	Schmidt and Co-workers
	Cornelius	Schmidt and Co-workers	Cornelius Dynamic Hardness 3 Standard Alloys 27 Substitutes	Schmidt and Co-workers Static Hardness 1 Standard Alloy 32 Substitutes	A	B*)		
C	1.16— 1.4	1.25	1.1 — 4.2	0.75— 2.0	1.45— 1.70	1.6	2.5— 2.7	††)
Si	1.17— 2.52	N. Sp.	0.4 — 3.0	1.4 — 3.7	1.5 — 2.5	2.3	1.5— 2.0	
Mn	0.3 — 0.4	N. Sp.	0.2 — 6.8	0.4 — 1.5	about 0.5	0.6	about 0.4	
Co	60.91—65.32	65	0 —65	0 —46.3	34 —36	19	30 —35	19
Cr	24.64—26.8	28	23 —29	15.6 —31.3	25 —28	27	26 —28	28
Mo	.....	.....	0 — 4.6	0 — 5.1	.....	4.5	.....	5
W	3.43— 7.58	4	0 —16	3.6 — 6.6	3.5 — 4.0	4.0	14 —15	5
V§)	.....	.....	0 — 3.1	.....	.....	.....	.....	.....
Ni§)	.....	.....	.....	0 —10.1	.....	.....	.....	.....
Fe	1.11— 3.07	.....	0.77—57.53	9.6 —65	bal.	bal.	bal.	.....

*) Application is discouraged because of "high content of imported molybdenum."
††) Not specified; experimental alloys of recommended type contained: 1.57-1.75% C, 1.89-2.35% Si, 0.5-1.53% Mn.
§) Nickel, vanadium and boron unsuited for hard facing alloys.
N.Sp. = Not specified.

en considerably below that at which its last trace disappeared on heating.

Six copper-aluminum alloys containing 8.89 to 13.89 per cent aluminum also show only a small loss of dynamic hardness for the alpha phase at rising temperatures (Fig. 29). A marked hardness change is caused by the beta = alpha + gamma transformation. These findings agree well with Matsuda's[9] dynamic hardness tests on eight copper-aluminum alloys ranging from 1.38 to 11.21 per cent aluminum. However, his tests on brass (Fig. 30) agree only qualitatively with those of Edwards and Herbert, who disregard the energy lost in the rebound. They also performed their tests on the same sample at falling temperatures, a rather unusual procedure.

Matsuda plots the indentations and heights of rebound against temperature and also calculates the dynamic hardness H according to

$$H = \frac{E}{V} = \frac{W\,(h_1 - h_2)}{\frac{\pi}{3}\,h^2\,(3R - h)}$$

where E = energy consumed, in millimeter-kilogram,

V = depressed volume, in cubic millimeter,

W = weight of hammer (one kilogram)

h_1 = height of fall, in millimeter (30 millimeters)

h_2 = height of rebound of hammer, in millimeters

$h = R - \sqrt{R^2 - r^2}$

r = radius of indentation, in millimeters

R = radius of ball, in millimeters (10 millimeters)

All the alpha brass samples were annealed for 30 min. at 700 deg. C. (1290 deg. F.) and then cooled in air. The heterogeneous alloys had the same thermal treatment followed by furnace cooling to 400 deg. C. (750 deg. F.) and air-cooling. Six of the author's 12 dynamic hardness curves are shown in Fig. 30. No marked break occurs in the alpha range. In the two-phase range, pronounced softening below the room temperature hardness takes place at about 450 deg. C. (840 deg. F.), the absolute and relative loss of dynamic hardness being the greater the higher the zinc content. In brasses containing 42 to 50 per cent zinc, the dynamic hardness rises to a peak value at 350 deg. C. (660 deg. F.). The rebound hardness curves of brasses containing over 35 per cent zinc also show an increased "elasticity" at 250 to 550 deg. C. (480 to 1020 deg. F.). The differences in pretreat-

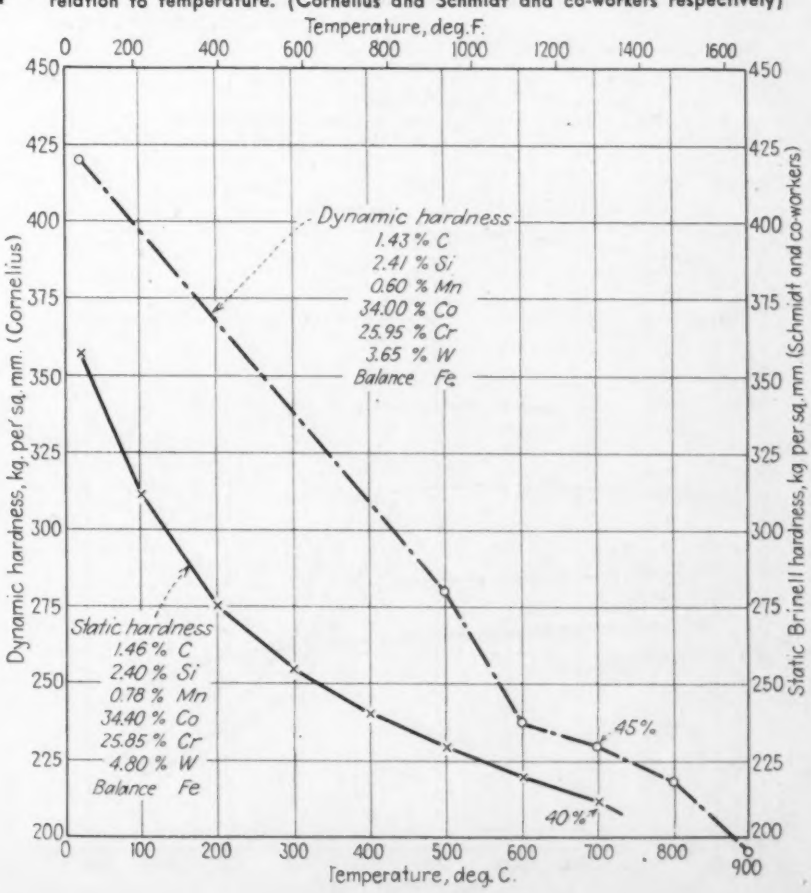
TABLE VIII

Evaluation of Experimental Alloys as to their Suitability for Hard Facings on Exhaust Valves of Airplane Engines.

Alloy No.	Structure Stability below 900° C (1652° F)	Thermal Expansion	Hardness at Room Temperature	Hardness at 800° C (1472° F)	Scaling Resistance at 900° C (1652° F)	Weldability			Resistance to Temperature Cycles
						Fusion Temperature	Behavior in Facing	Quality of Deposits	
1	1	2	(1)	1	1	1	1	2—3	1
2	1	2	(1)	2	1	1	1	2	3
3	1	2	(1)	1	1	1	1	1	2
4	1	1—2	(1)	1—2	1	1	1—2	2	2
5	1	2	(1)	2	1	1	1—2	1	2—3
6	1	2	(2)	2	1	1	1—2	2	1
7	1	1	(4)	4	1	1	1—2	3	1
8	1	2	(3)	3—4	1	1	1—2	1	1
9	1	1—2	(2)	2	1	1	1—2	2	2
10	1	1—2	(1)	1—2	1	1	1—2	2	3
11	1	1—2	(4)	4	4	1	3	2	1
12	1	1—2	(2)	3	1	1	1—2	1	3
13	4	1—2	(1)	2—3	3	1	2—3	1	3
14	1	2	(1)	1—2	1	1	2	2	3
15	4	1	(2)	2	1	1	4	2	3
16	4	.....	(1)	3	1	1	2	1	3
17	3	3	(4)	4	1	3	3	1	3
20	1	(2—3)	1	(1)	(1)	1	1	[1—2]	[3]
21	1	(3—4)	1	(1)	(1)	1	1	[3]	[3]
22	1	(2—3)	1	(2)	(1)	1	1—2	[4]	[4]
23	1	(3)	1	(2)	(1)	1	1—2	[4]	[4]
24	1	(2—3)	1	(2)	(1)	1	1—2	[1]	[4]
25	1	(2—3)	1	(2)	(1)	1	1—2	[1]	[4]
26	4	(2—3)	1	(2—3)	(1)	1	3	[4]	[3]
27	4	(2—3)	1	(2—3)	(1)	3	4	[4]	[3]

Ratings: 1 = meets high requirements; 2 = satisfactory; 3 = satisfactory under certain conditions; 4 = not satisfactory; ( ) property of minor importance; [ ] method of testing inadequate for the particular application.

FIG. 25—Dynamic vs. static hardness of two medium-cobalt Stellite substitute alloys in relation to temperature. (Cornelius and Schmidt and co-workers respectively)



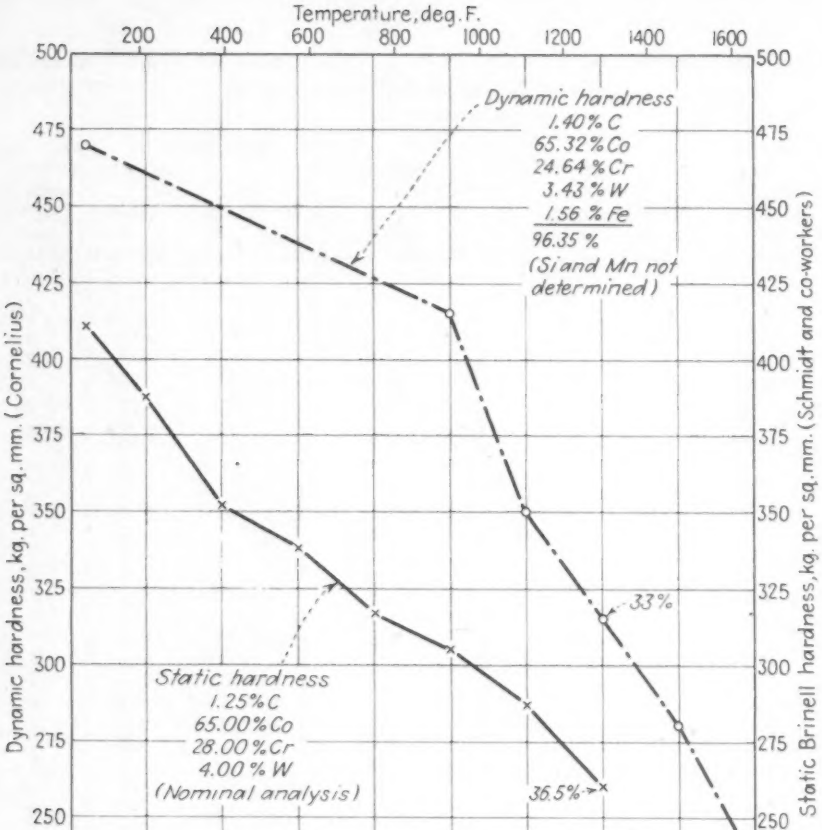


FIG. 26—Dynamic vs. static hardness of two standard Stellites in relation to temperatures. (Cornelius and Schmidt and co-workers respectively).

o o o

ment and testing procedure probably account for the disagreement between Figs. 27 and 30.

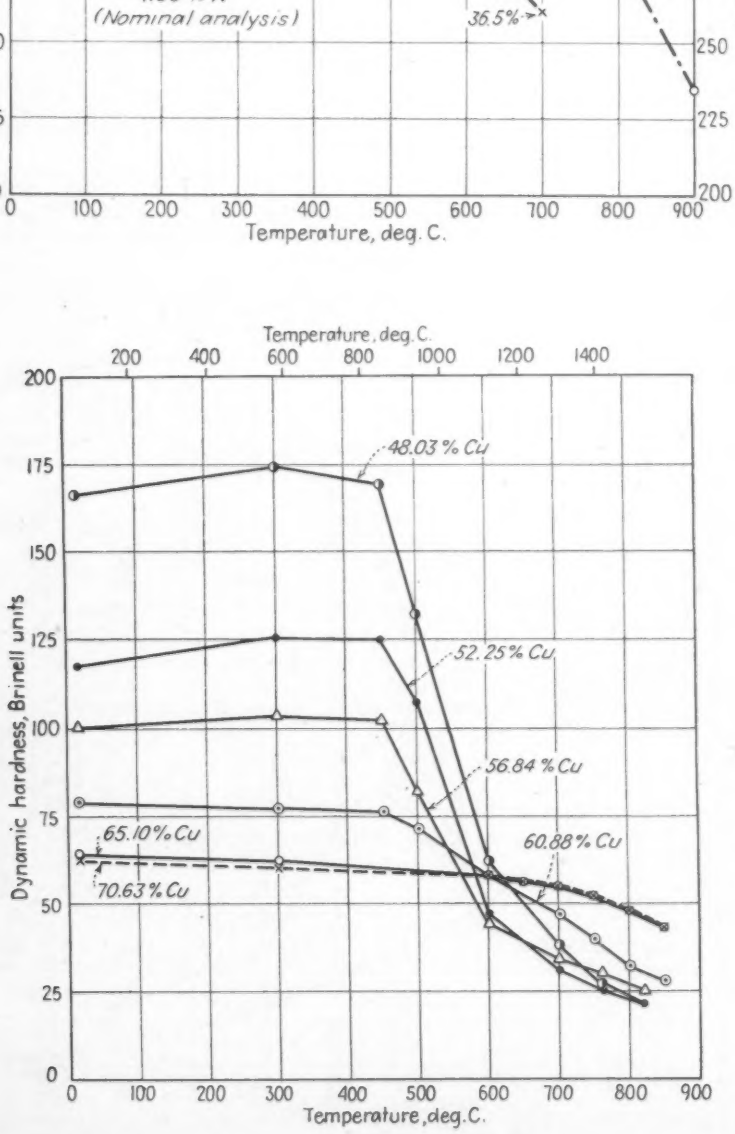
Bronzes containing up to 13.11 per cent tin were cold rolled 50 per cent. Annealing at 700 deg. C. (1290 deg. F.) and air-cooling was applied to bronzes up to 9.20 per cent tin. Alloys with higher tin contents were annealed at 600 deg. C. (930 deg. F.) and cooled in air. Bronzes with 2 to 13 per cent tin gradually decrease in hardness with rising temperatures (Fig. 31). At 15 to 21 per cent tin, a drastic change of hardness, which is the more pronounced the higher the tin content, takes place due to the eutectoid transformation of alpha + delta = beta during heating. While the hardness at room temperature increases with the tin content, this is reversed at over 600 deg. C. (1110 deg. F.), since the beta phase is softer than the alpha solid solution.

(G) EFFECT OF RISING TEMPERATURES ON THE DYNAMIC HARDNESS OF ALUMINUM AND ITS WROUGHT ALLOYS: Brenner and Kostron[25] state that the deformation speed of aluminum alloys affects but little their resistance to plastic deformation at ordinary temperature, but that it increases rapidly with rising temperatures. Laboratory testing speeds should therefore be adapted to deformation rates applied in commercial practice.

The authors redesigned the dynamic hardness tester of von Schwarz[26] and made a comprehensive study of commercial wrought aluminum alloys (Table X). An 0.25 kilogram ram falling 50 cm., strikes at a velocity of 3.1 meters per sec. a 10 mm. steel ball held by a centering device on the surface of the test piece in the furnace (Fig. 32). The dynamic hardness or "displacement work" L is expressed as

$$L = \frac{E}{V} \text{ kg. per cu. mm.,}$$

where E = energy of deformation and V = volume of indentation, or



o o o

FIG. 27—Dynamic hardness of brass in relation to zinc content and temperature (Edwards and Herbert).

$$V = \frac{\pi}{32} \times \frac{d^4}{D}$$

where d = diameter of indentation, D = diameter of steel ball; or, for D = 10 mm., V = 0.01 d^4.

The annealed, non-aging aluminum alloys show a roughly linear drop in hardness with rising temperature. The hardness curves of the softest alloys are slightly convex and those of the harder alloys slightly concave (Fig. 33). The order of softness at room and elevated temperatures is: aluminum (softest), aluminum-silicon, aluminum-manganese, aluminum-manganese-magnesium and aluminum-magnesium (hardest). Rising additions of magnesium increase the dynamic hardness linearly (Fig. 34). The slight deviations from a straight line are caused by variations in the alloy elements other than magnesium, notably by manganese.

Owing to their unstable state, quenched aluminum alloys subject to precipitation hardening are naturally sensitive towards heating. In the soft-annealed state, characterized by the absence of supersaturation, the "Duralumin" types Ia and Ib behave practically like the non-aging types (Fig. 35). On quenching from 505 deg. C. (940 deg. F.) and aging at room temperature, the dynamic hardness decreases at first moderately. Drastic softening takes place at about 250 deg. C. (480 deg. F.), where the precipitation hardening effect is lost. Quenched samples held at testing temperature for 15 days instead of for 1 hr., pass through a hardness maximum at 100 deg. C. followed by rapid softening.

Alloy type II (aluminum-copper-nickel) differs but little from type I (aluminum - copper - magnesium) except that the nickel-bearing alloy is harder at temperatures exceeding 250 deg. C. (480 deg. F.) (Fig. 36). Alloy type III (aluminum-copper) is slightly harder than Ia at lower temperatures and softer at higher. Aluminum-magnesium-silicon is soft at all temperatures. It softens markedly above 200 deg. C. (390 deg. F.).

Characteristic curves shown in Fig. 37 lead to the following conclusions: Whenever the resistance against deformation by dynamic forces prevails, aluminum-magnesium alloys high in magnesium should be used above 270 deg. C. (520 deg. F.). Below this temperature, precipitation-hardening alloys containing copper are superior. The differences between aluminum-copper-magnesium, aluminum-copper-nickel and aluminum-copper are comparatively small. The dynamic hardness of the aluminum-magnesium and aluminum-magnesium-manganese alloys depends primarily on the magnesium content, which raises the hardness in a linear fashion.

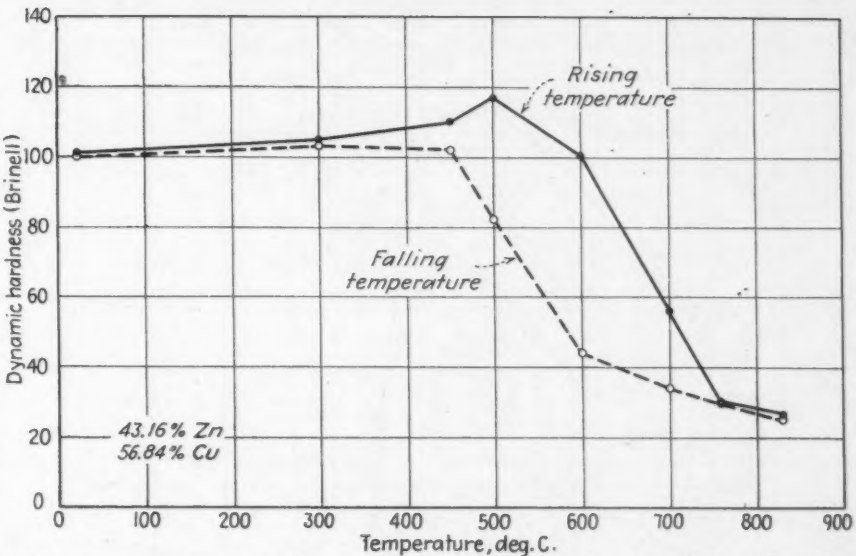


FIG. 28—Dynamic hardness of brass tested at rising and falling temperatures (Edwards and Herbert).

In establishing some fundamental relationships underlying dynamic hardness testing, Shishokiv and Vikhoreva[33] determined the loss of dynamic hardness with rising temperatures on copper, nickel, lead, aluminum, tin, cadmium, bismuth and on the eutectics of bismuth-cadmium, lead-cadmium, bismuth-tin, lead-tin, lead-bismuth, cadmium-lead-tin, bismuth-cadmium-lead and cadmium-bismuth-lead-tin.

(H) THE PRESENT STATE OF DYNAMIC HARDNESS TESTING: A fair qualitative agreement exists between the testing results obtained by different investigators on similar material under greatly varying testing conditions and expressed in a variety of empirical and rational hardness units. However, if the dynamic hardness test and its apparatus were stand-

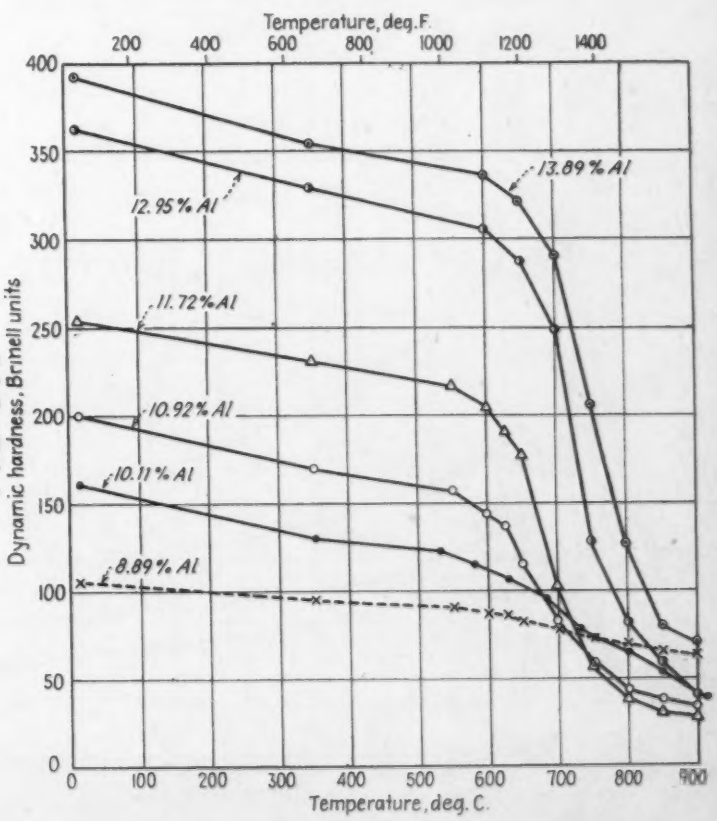


FIG. 29 — Dynamic hardness of copper-aluminum alloys in relation to aluminum content and temperature (Edwards and Herbert).

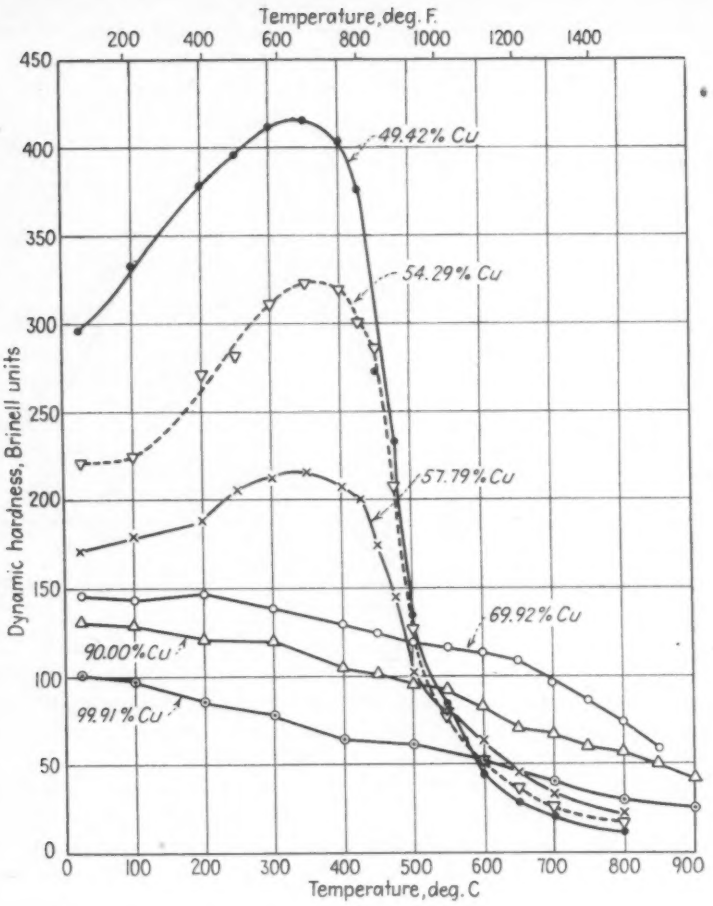


FIG. 30—Dynamic hardness of brass in relation to zinc content and temperature (Matsuda).

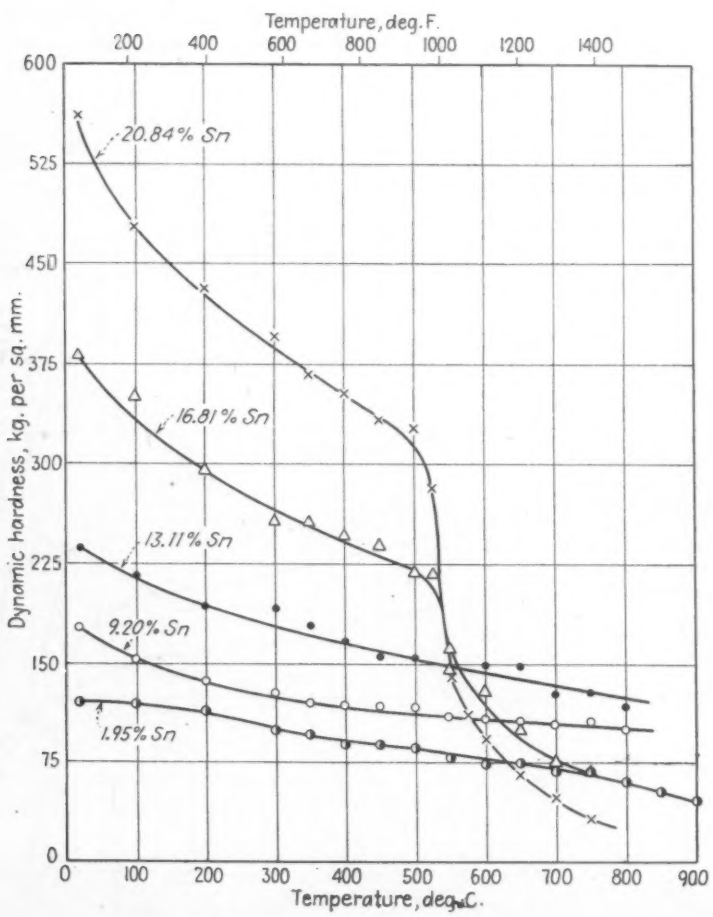


FIG. 31—Dynamic hardness of bronze in relation to tin content and temperature (Matsuda).

ardized, quantitative comparisons could be made and the "art of dynamic hardness testing" elevated to a science.

In pursuit of this goal, the dynamic hardness tester based on the measurement of the rebound of a light moving member can not claim primary consideration. It measures largely the elastic properties rather than the resistance to plastic deformation and, therefore, should find a field of application where *elastic* deformations prevail (springs, valves, projectiles, etc.). The disregard of the small, though varying energy loss in the minute indentation constitutes a further fundamental objection to this tester[27]. It also entails many experimental difficulties at elevated temperatures at which the dynamic indentation method offers particularly great advantages. Kuntze's suggestion[28] that the ratio of the weights of moving member and test piece should be constant in dynamic hardness testing needs experimental verification. It may hold only for the rebound hardness tester.

We are here primarily interested in the art or technique of dynamic hardness testing, especially in its application at elevated temperatures rather than in its theoretical, scientific aspects. Therefore, only honorable mention can be made of the thought-provoking, fundamental deliberations of Roudié[37] on the nature of hardness and the possibility of its scientific definition and determination as *dynamic* hardness expressed in C-G-S units.

The dynamic hardness tester can only be placed on a rational basis if the principal energy loss in the rebounding indenter is taken into account.

With similar material of approximately the same elastic properties, the measurement of only the indentation furnishes useful data and

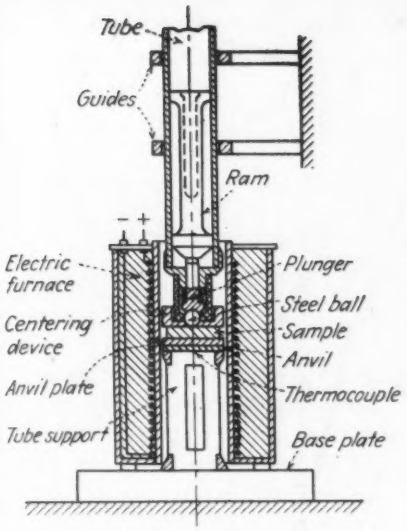


FIG. 32—Dynamic hardness tester for testing aluminum alloys at raised temperatures (Brenner and Kostron).

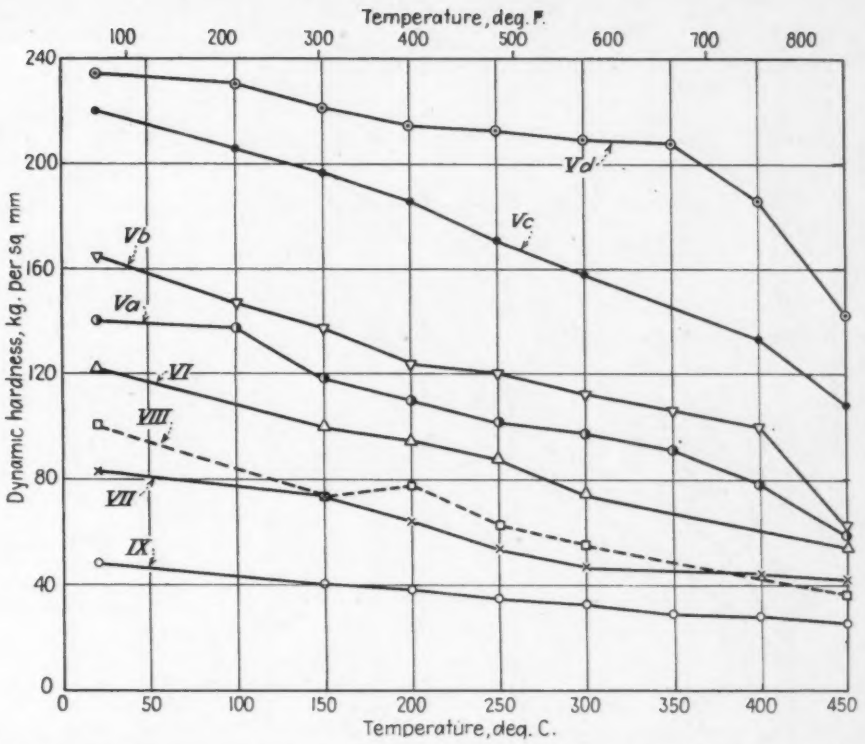


FIG. 33—Dynamic hardness of non-aging aluminum alloys up to 450 deg. C. (840 deg. F.) (Brenner and Kostron).

suffices for purposes of comparison. But a quantitative comparison of a great variety of metallic materials calls for the determination of the rebound energy. A measurement of the height of rebound meets experimental difficulties at elevated temperatures if the test is performed in the furnace. A relatively simple solution is incorporated in the Walzel machine.[16,23] However, the swinging pendulum tester is open to theoretical objection in that its rigid construction permits a transference of energy by stress propagation to earth.

Brenner and Kostron[25] attempted an interesting new approach without actually measuring the height of rebound. They permitted the rebounding hammer to produce a second, third, fourth, etc., impression on the quickly shifted sample. The volumes of indentation were found to decrease with successive rebounds in geometric progression (Fig. 38). The ratio x of the volumes of successive indentations increases linearly with the hardness of the testing material (Fig. 39). The sum of this geometric progression i.e., the total volume V_s of all successive impressions

$$V_s = V_1 \frac{1}{1 - x}$$

where V_1 = volume of the first impression. The volumes of indentation are also approximately proportional to the impact energies. The energy E_1 used for producing the first indentation can be derived from the total impact energy E:

$$E_1 = E \frac{V_1}{V_s}$$

Thus deducting the rebound energy, the corrected dynamic hardness H_d becomes

$$Hd = \frac{E_1}{V_1} = \frac{E}{V_s} = \frac{E\,(1 - x)}{V_1}$$

The error introduced by the elastic properties of the base carrying the sample is eliminated by means of a calibration curve (Fig. 40) showing the interrelation between the "dis-

Type X

Composition of Aluminum Alloys Tested for Dynamic Hardness by Brenner and Kostron

(Figs. 33 to 37)

Type	Symbol	PER CENT Cu	Mg	Mn	Si	Fe	Ni
I Al-Cu-Mg	Ia	4.86	1.25	1.17	0.54	0.41	....
	Ib	4.04	0.73	0.75	0.47	0.35	....
II Al-Cu-Ni	II	4.3	1.95	....	....	....	1.93
III Al-Cu*	III	5.0	....	0.5	0.3	0.3	....
IV Al-Mg-Si	IV	0.04	0.73	0.66	0.65	0.30	....
V Al-Mg	Va	....	3.04	0.33	0.36	0.28	....
	Vb	....	5.28	0.42	0.38	0.35	....
	Vc	....	7.12	0.39	0.35	0.33	....
	Vd	....	9.36	0.30	0.29	0.30	....
VI Al-Mg-Mn	VI	0.03	1.39	1.11	0.39	0.34	....
VII Al-Si	VII	0.00	0.00	0.00	12.95	0.48	....
VIII Al-Mn	VIII	0.02	0.00	1.41	0.29	0.34	....
IX Al-99.5%	IX	Si + Fe + Cu + Zn < 0.5 Per Cent					

* Approximate composition.

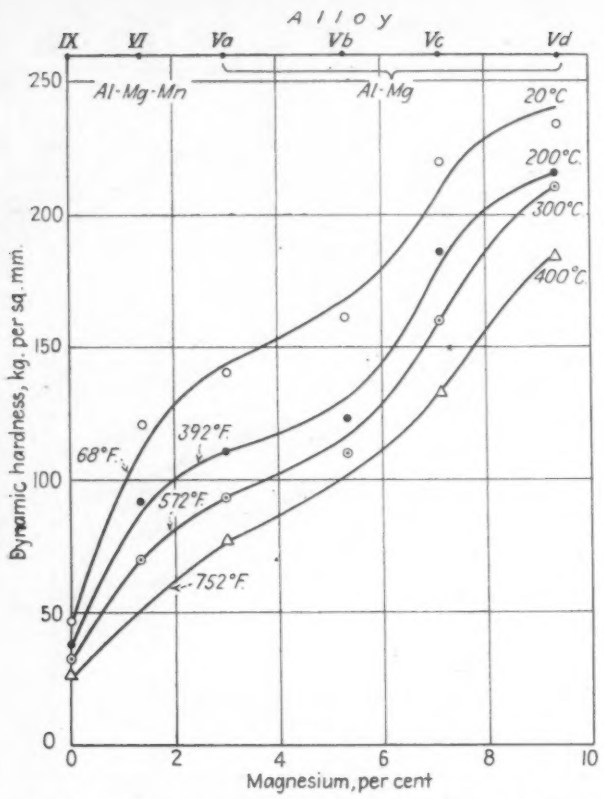


FIG. 34—Dynamic hardness of non-aging aluminum alloys in relation to magnesium content and temperature (Brenner and Kostron).

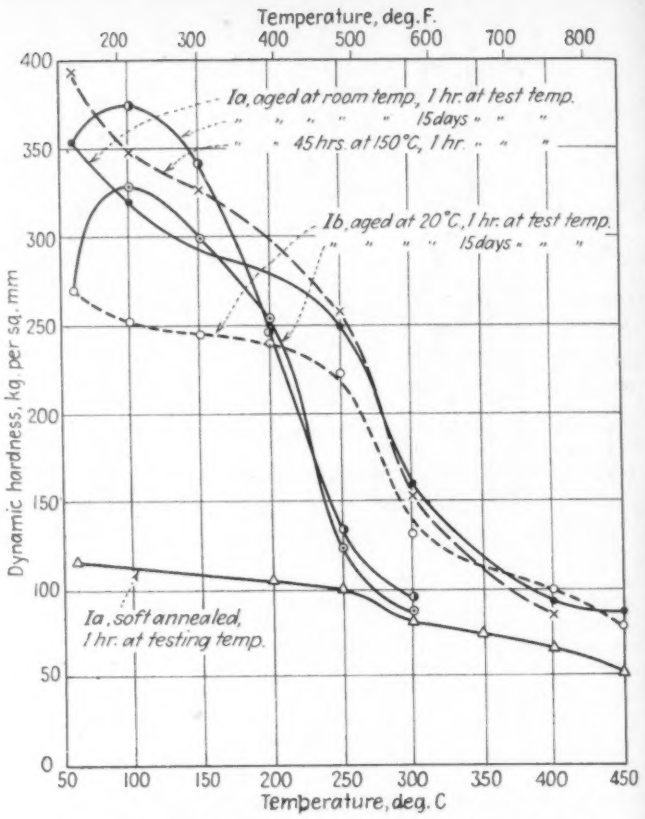


FIG. 36—Dynamic hardness of precipitation-hardening aluminum alloys (Table X) in relation to temperature. Time at testing temperature = 1 hr. (Brenner and Kostron).

FIG. 35—Dynamic hardness of aluminum alloys, aluminum-copper-magnesium (Table X) in relation to temperature and pretreatment (Brenner and Kostron).

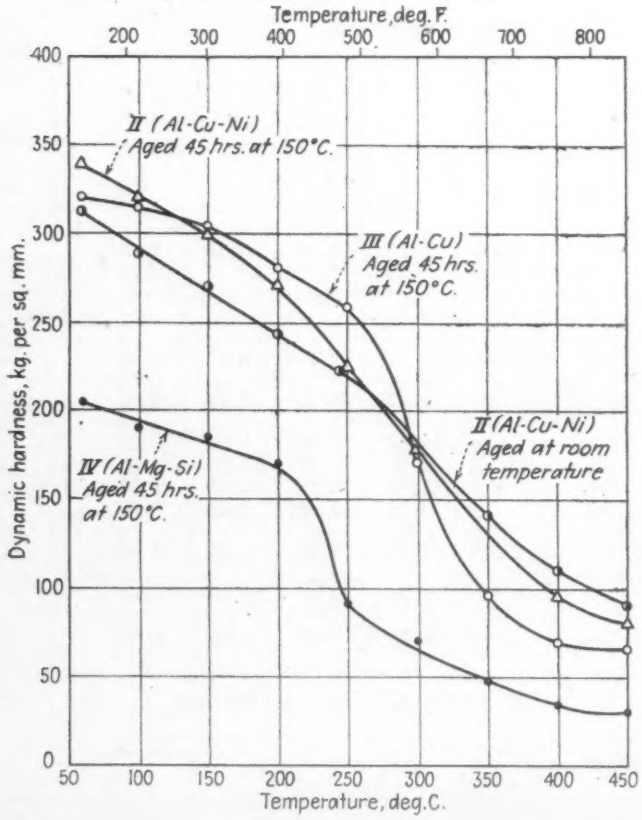
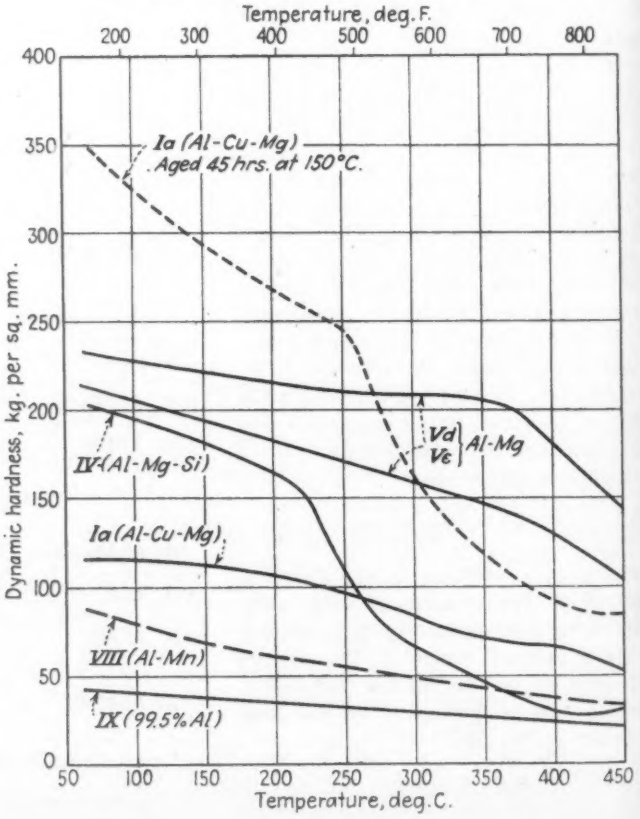
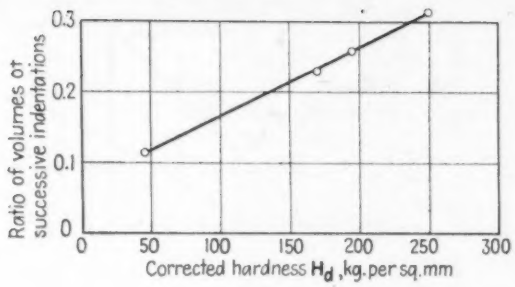


FIG. 37—Dynamic hardness of various types of aluminum alloys (Table X) in relation to temperature. Time at testing temperature: one hr. (Brenner and Kostron).





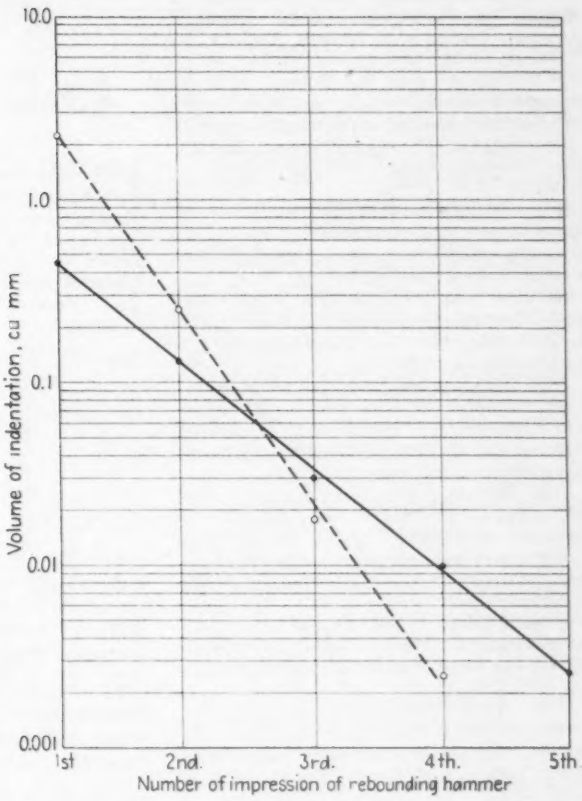
ABOVE LEFT

FIG. 39—Ratio of volumes of successive indentations in relation to dynamic hardness (Brenner and Kostron).

o o o

RIGHT

FIG. 38 — Change of size of first and subsequent indentations produced by rebounding ram on two aluminum alloys (Brenner and Kostron).



placement work" L (L = E/V) and the corrected dynamic hardness H_d.

The tester of Brenner and Kostron (Fig. 32) is obviously limited to the use at medium temperatures. A dynamic hardness machine incorporating *all* the advantages of different designs developed so far, does not exist. Before adopting any particular type for universal use, it is necessary to establish first the significance and magnitude of several factors such as energy losses due to transferences to earth, friction, sound, heat, elastic deformation of indenter and support, etc. This however, should not be a deterrent to adopting the dynamic hardness tester as a valuable tool in collecting data of practical and scientific value.

The room temperature hardness testing methods (Brinell, Rockwell, Vickers, etc.) owe their universal application to a large extent to the satisfactorily close relationship between indentation hardness and tensile strength and to the relative ease of measuring the hardness. At elevated temperatures, the static tensile test, revealing the importance of the strain rate, has been supplemented by small load, long-time creep tests which call for elaborate testing equipment.

Recent efforts abroad strive to interrelate creep and the flow of materials in indentation hardness testing[7, 28]. As to elevated temperature tests at rapid strain rates, the dynamic tensile test has gained little ground abroad[2] and recently a foothold in this country[6, 30]. The high-speed tensile test also calls for an elaborate equipment and sensitive measuring devices involving at present some instrumental pitfalls[31].

Körber and Simonsen[2] investigated to see whether the dynamic tensile test could be replaced by a dynamic indentation hardness test. They found a proportionality to exist at elevated temperatures between dynamic hardness and mean dynamic stress a_m in dynamic tensile tests:

$$a_m = \frac{a}{\epsilon}$$

where ϵ = elongation of gage length, and a = specific impact energy which was

$$a = \frac{A}{V}$$

where A = total energy spent, in meter-kilogram, and V = volume of test piece, in cubic centimeter.

The dynamic tensile testing machine has an invaluable advantage in that it permits the testing over an amazingly large range of deformation speeds. The main assets of the dynamic hardness tester are its simplicity, efficiency and reliability.

Acknowledgment

The author wishes to thank L. S. Bergen, Associate Director of Metallurgy and Research, Crucible Steel Co. of America, for the permission to publish the author's experimental work; P. A. Payson, Chief Research Metallurgist, Atha Research Laboratory, Harrison, N. J., under whose supervision this work has been carried out; H. Brutcher, Technical Translation Service, Altadena, Cal., for furnishing specific information recently published abroad.

Bibliography

[1] E. Fetz, "Dynamic Hardness Testing of Metals and Alloys at Elevated Temperatures," Transactions, American Society for Metals, Vol. 30, 1942, p. 1419-1461. Discussion, p. 1461-1462.

[2] F. Körber and I. B. Simonsen, "Dynamische Prüfung des Stahles bei höheren Temperaturen," Mitteilungen, Kaiser-Wilhelm-Institut für Eisenforschung, Vol. 5, 1924, p. 21-35.

[3] H. J. Tapsell and W. J. Clenshaw, "Properties of Materials at High Temperatures, I and II," Department of Scientific and Industrial Research, Engineering Research, Special Report No. 1, London, 1927, 59 p. and 16 p. respectively.

[4] R. Walzel "Statische und dynamische Warmhärte von Stählen," Archiv für das Eisenhüttenwesen, Vol. 10, 1937, p. 577-580.

[5] M. Itihara, "Impact Torsion Test," Technology Reports, Tōhoku Imperial University, Vol. 11, 1933-1935, p. 16-50, p. 83-165; Vol. 12, 1936-38, p. 63-118. (In English.)

[6] A. Nádai and M. Manjoine, "High Speed Tension Tests at Elevated Temperatures, Parts II and III," Transactions, American Society of Mechanical Engineers, Vol. 63, 1941, p. A77-A91.

[7] W. Jung-König, E. Schmid and H. D. Graf von Schweinitz, "Heranziehung von Härtezeitkurven zur Beurteilung des Dauerstandsverhaltens," Metallwirtschaft, Vol. 19, 1940, p. 492-494.

[8] C. A. Edwards and A. M. Herbert, "Plastic Deformation of Some Copper Alloys at Elevated Temperatures," Journal, Institute of Metals, Vol. 25, I, 1921, p. 175-199. Discussion, p. 200-218.

[9] T. Matsuda, "On the Dynamic Hardness of Bronze, Aluminum-Bronze and Brass at Elevated Temperatures," Science Reports, Tōhoku Imperial University, Vol. 13, I, 1925, p. 401-411 (In English).

[10] G. D. Bengough, "A Study of the Properties of Alloys at High Temperatures," Journal, Institute of Metals, Vol. 7, I, 1912, p. 123-174. Discussion, p. 175-190.

[11] F. Sauerwald, "Die Warmverformung der Metalle, ihre Kennzeichnung und ihre Beziehung zur Kaltverformung," Metallwirtschaft, Vol. 7, 1928, p. 1353-1358 (Summarizes all previous papers by Sauerwald and coworkers).

[13] C. A. Edwards, "The Resistance of Metals to Penetration under Impact," Journal, Institute of Metals, Vol. 10, II. 1918, p. 61-98. Discussion, p. 98-108.

[14] F. Körber and A. Pomp, "Vergleichende Untersuchungen von warmfesten Werkstoffen bei höheren Temperaturen," Mitteilungen, Kaiser - Wilhelm - Institut für Eisenforschung, Vol. 18, 1936, p. 247-251.

[15] F. Bollenrath, H. Cornelius and W. Bungardt, "Untersuchungen über die Eignung warmfester Werkstoffe für Verbrennungskraftmaschinen. x1. Teil. Mechanische und physikalische Eigenschaften," Luftfahrtforschung, Vol. 15, 1938, p. 468-480. "2. Teil. Zunderbeständigkeit," Ibid., p. 505-510.

[15] M. Hamasumi, "The High Temperature Hardness of Iron and Steel," Journal, Society of Mechanical Engineers, Tokyo, Vol. 35, 1932, p. 761-765. (In Japanese, English summary.)

[16] R. Walzel, "Härteprüfung mit dem Pendelfallwerk," Stahl und Eisen, Vol. 54, 1934, p. 954-957.

[17] E. Both and W. Rohn, "Die Prüfung der Warmfestigkeit im Dauerversuch unterhalb und oberhalb der Rekristallisationsgrenze," Vorträge der Hauptversammlung 1938 der Deutschen Gesellschaft für Metallkunde, VDI Verlag, Berlin NW 7, p. 16-22.

[18] W. Oertel and F. Pölzguter, "Mechanische Eigenschaften einiger Schnellstähle im Vergleich zu ihrer Schnittleistung," Stahl und Eisen, Vol. 44, 1924, p. 1708-1713.

[19] L. Guillet and H. Godfroid, "Que'ques Observations Sur "Le Stellite," La Revue de Métallurgie, Vol. 15, 1918, p. 339-346.

[20] J. F. Kaiser, "Brinell Machine for High Temperature Testing," Engineering, Vol. 109, 1920, p. 157.

[21] A. R. Page, "Some Experiments on the Impact Hardness of High Speed Steels," Metallurgia, Vol. 3, 1930/31, p. 85-86.

[22] F. Wever and U. Haschimoto, "Ueber das Zweistoffsystem Kobalt-Chrom, mit einem Beitrag zur Kenntnis der Eigenschaften von Kobalt-Chrom Legierungen und einem Anhang über den Einfluss einiger Elemente auf die Eigenschaften der Kobalt-Chrom Legierungen," Mitteilungen, Kaiser - Wilhelm - Institut für Eisenforschung, Vol. 11, 1929, p. 293-330.

[23] H. Cornelius and W. Trossen, "Pendelfallhärte-Prüfgerät," Stahl und Eisen, Vol. 60, 1940, p. 293-294.

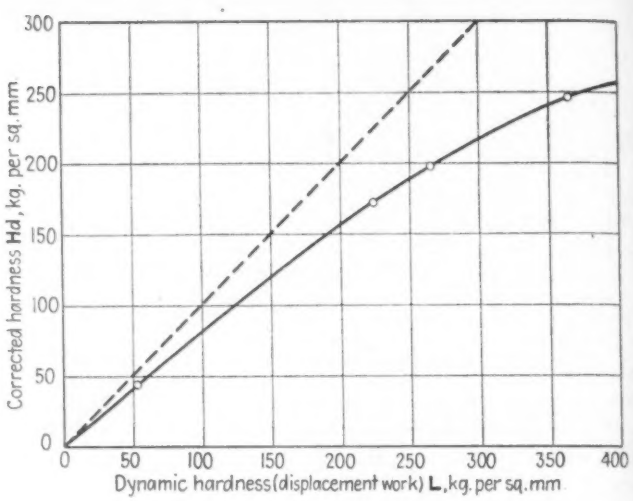


FIG. 40—Calibration curve for dynamic indentation hardness tester shown in Fig. 32 (Brenner and Kostron).

[24] C. A. Edwards and F. W. Willis, "A Law Governing the Resistance to Penetration of Metals When Tested by Impact," Proceedings, Institution of Mechanical Engineers, 1918, p. 335-369. Discussion, p. 493-597.

[25] P. Brenner and H. Kostron, "Schlaghärteversuche an Aluminum-Knetlegierungen," Zeitschrift für Metallkunde, Vol. 29, 1937, p. 293-296.

[26] M. von Schwarz, "Statische und dynamische Kugeldruckhärteprüfung," Stahl und Eisen, Vol. 42, 1922, p. 582-588.

[27] E. Fetz, Discussion to "A New Method and Machine for Dynamic Hardness Testing," by W. M. Patterson, Proceedings, American Society for Testing Materials, Vol. 35, II, 1935, p. 305-322. Discussion, p. 316-322.

[28] W. Kuntze, "Richtlinien für einheitliche Härteprüfung," Mitteilungen Deutscher Materialprüfungsanstalten, Sonderheft No. 38, 1936, p. 121-124.

[29] K. Löhberg and F. Wolbank, "Härtekriechversuche an Zinklegierungen," Zeitschrift für Metallkunde, Vol. 32, 1940, p. 419-424.

[30] M. Manjoine and A. Nádai, "High-Speed Tension Tests at Elevated Temperatures, Part I, "Proceedings, American Society for Testing Materials, Vol. 40, 1940, p. 822-837. Discussion, p. 838-839.

[31] A. Nádai, A. V. de Forest, D. S. Clark and S. L. Hoyt, Discussions to "Effects of Strain Rate upon the Tensile Impact Strength of Some Metals," by E. R. Parker and C. Ferguson. Transactions, American Society for Metals, Vol. 30, 1942, p. 68-80. Discussions, p. 80-85.

[32] T. Tanabe, "Studies in the Aluminum-Zinc System," Journal, Institute of Metals, Vol. 62, II, 1924, p. 415-453.

[33] V. P. Shishokiv & N. A. Vikhoreva, "Influence of the Height of Fall and of Temperature on the Impact Hardness of Metals and Their Alloys," Zhurnal Tekhnicheskoi Fiziki, Moscow, Vol. 10, 1940, p. 500-504. (In Russian.)

[34] H. Cornelius, "Der Einfluss der Zusammensetzung auf die Eigenschaften von Aufschweisslegierungen," Archiv für das Eisenhüttenwesen, Vol. 15, 1941, p. 47-58.

[35] M. Schmidt, W. Lamarche and E. Kauhausen, "Die Verminderung des Kobaltgehaltes in Aufschweisslegierungen," Archiv für das Eisenhüttenwesen, Vol. 14, 1941, p. 357-362.

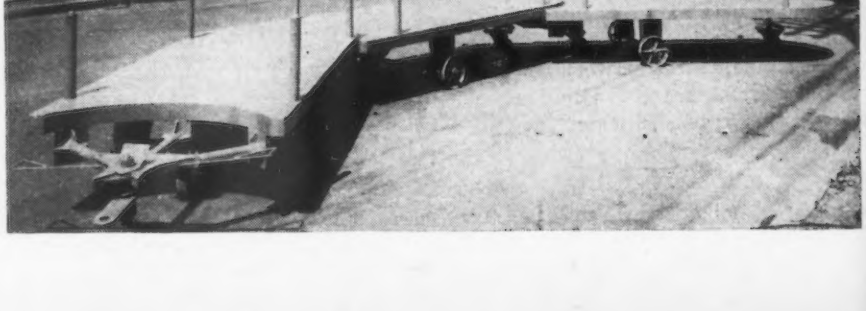
[36] O. E. Harder and H. A. Grove, "Hot Hardness of High-Speed Steel and Related Alloys," Transactions, American Institute of Mining and Metallurgical Engineers, Vol. 105, 1933, p. 88-124. Discussion, p. 125-132.

[37] P. Roudié, "Le Contrôle de la Dureté des Métaux dans l'Industrie," Dunod, Paris, 1930, 114 p.

"Articulated" Truck Carries Blimp Fabric

THE "articulated" truck shown in the accompanying photograph takes sharp curves and corners in narrow aisles or driveways, hugging the turn like a permanently installed conveyor system. The truck, which was developed by Irvington Steel & Iron Works, Irvington, N. J., for the U. S. Naval Depot at Lakehurst, N. J., is used to carry naval blimp fabric. The fabric, loaded full length along the truck, is never pinched or plucked in transit.

The truck is mounted on a chassis with wheels set at the points of a St. George's cross. The tongue-like convex rear fits precisely into the concave front of the following truck.



Carbide Drawing Dies

IN Report No. 11 of the committee for wire manufacture of the Verein deutscher Eisenhüttenleute by J. Hinnuber, published in *Stahl und Eisen*, the author gives a general survey of the production of tungsten carbides and their use as drawing dies, together with a consideration of various practical questions. The production and use of these materials as dies has been much favored in Germany owing to the shortage of diamond dies and the need for the provision of a reasonable substitute from indigenous materials.

At first the carbides were cast to shape, but owing to various difficulties these were soon supplanted by the sintered variety of die. There were three reasons for this substitution: (1) Sintering took place more than 1.000 deg. below the temperature required for melting and could thus be better controlled than pouring at a much higher temperature; also, the cast alloys consisted mainly of W_2C with 3.2 per cent C, while the sintered alloys were the much tougher WC with 6.1 per cent C, but is less stable in the molten state. (2) Larger and more uniform products could be made with the sintered carbide than with the cast one. (3) By graduating the content of Co added as a binder, the hardness and toughness of the sintered alloy could be varied between wide limits.

A comparison of the properties of carbides are given in Table I.

Following a description of the method of manufacture of Widia and Widia-Elmarid carbides, the two principal German examples of these products, and the setting and choice of the carbides as drawing dies, the author discusses means for increasing the performance of these dies and further economizing in the use of diamond. Diamond has become increasingly scarce in Germany and the carbides have had to be used more and more for the smaller sizes of dies leading inevitably to a reduction in the drawing speed. Judging from past experience, Gl (Table I) can be used for dies down to 0.2 mm. diameter with unalloyed steel using soap as a lubricant, but results are not so good with Cr, Cr-Ni and Cr-Ni-Al wires, even on wet drawing. With copper, the present limit for the use of a carbide die is around 0.8 mm. In most cases diamond has still to be used for the final pass.

Further substitution of diamond and a solution of the problem of increasing the performance of carbide dies will probably hinge on the elucidation of the conditions governing the formation of the lubricating film and how and to what extent wear of the dies can be reduced. The mere fact that the dies do wear is a proof that this film frequently breaks down and that direct contact is established between the wire and the die. There are two ways in which the life of a drawing die can be increased, viz., (1) by giving suitable protection to the die material, and (2) by increasing the resistance to wear of this material by altering the composition of the alloy.

The first possibility may be tackled by considering whether better use could not be made of the principles of lubrication, pre-treatment of the stock to be drawn, and the effect of surface treatments, such as copper plating, lead coating, phosphating and brunorizing, as well as greater cooling. Schuster (1940), Durer, Schmid and v. Schweinitz (1942), and Faber and Kopp (1941) have shown that prior phosphate treatment of iron and steel facilitates drawing and multiplies the life of the drawing dies; also drawing can be done with lubricants with a lower content of animal fats owing to the greater adhesion of the lubricant to the phosphated coating.

TABLE I

Properties of Tungsten Carbides for Drawing Dies

Approximate Composition	Cast Carbide W_2C with WC	G 1 WC + 6 Co	G 2 WC + 11 Co	S 3 WC + 5 TiC + 6 Co
Specific gravity, gm. per cu. cm. ...	16.0	14.7	14.0	13.3
Approximate Vickers hardness ..	1,800 to 2,000	1,600	1,400	1,600
Bending strength, kg. per sq. mm.	35	160	185	150
Compressive strength, kg. per sq. mm.	....	425	380	....
Thermal conductivity, cal. per cm. per sec. per deg. C. ...	0.07	0.19	0.16	0.15
Coefficient of expansion, between 20 and 800 deg., 10^6 cm. per cm. per deg. C.	4	5	5.5	5.5
Specific heat, cal. per gm. per deg. C..	0.05	0.05	0.05	0.05
Coefficient of elasticity kg. per sq. mm.	....	62,000	58,000	59,000

Some practical experience supports the view that in deep drawing, graphite suspended in suitable dispersion agents is also useful if sufficiently adhesive coatings can be obtained. On this point, further research is needed on dispersion agents, which, like alkalis, retain their lubricating properties at higher drawing temperatures. Indications are that the addition of sulphur might be of use, for in machining metals exceptionally good results have been obtained with oils containing high proportions of sulphur. The counter-pull method of economizing in drawing power, up to 37 per cent under certain conditions of drawing, recently described by W. Lueg (1942) also promises to give considerable protection to the drawing dies, as less drawing power is imposed on the die.

In considering increased die performance by modifying alloy composition, it has to be remembered that the main wear on a drawing die is caused by the adhesion of the wire to the die. The adhesiveness of a carbide-cobalt alloy is, of course, considerably reduced by the addition of Ti carbide. Tools made of this mixture give a much better performance than the corresponding plain carbide-cobalt alloy, as adhesion begins at a much higher temperature with the mixture than with the plain alloy, as indicated by experiments by W. Dawihl (1940). Drawing tests with TiC alloys show that in wet drawing these give no better performances than Widia-Elmarid, although when using soap as a lubricant alloy S3 with 5 per cent TiC gives better results than the G1 alloy, to the tune of 50 per cent with steel of 130 kg. per sq. mm. rigidity and 0.5 to 0.6 mm. dia. with drawing speeds of 2.2 m. per sec. The author suggests that at very high drawing speeds the TiC alloys will prove the better, since in cutting tool alloys the wear-resisting action of TiC becomes effective only at high cutting speeds.

From experience with cutting tools it might be expected that the addition of small quantities of TaC to a tungsten carbide-cobalt alloy would give better results than higher additions. In drawing copper, better performances have indeed been obtained with these low TaC alloys than with Gi, but still not so good as with Widia-Elmarid. Various investigations have found that the addition of B carbide is an advantage, but experiments by the author show that a B carbide die has only one-tenth the efficiency of WC dies for drawing tungsten or steel wire. B carbide is much harder than WC, but lack of rigidity at the grain boundaries causes the edges of the die to crumble.

Tubes and Tube Making

WHILE there have been various improvements in cold drawing the method remains basically the same, a fact that proves the great importance of the refining process of cold drawing.

The rather well-known manner in which cold drawing is done is illustrated in Fig. 33. Two methods of drawing must be distinguished. One is the so-called drawing-on-the-bar method, where an inserted polished tool steel bar travels with the tube through the die and is then removed. The other method, of much greater importance, is the drawing over a plug mandrel which is fastened to the end of a rod, as shown in Fig. 33. The mandrel is so adjusted that the plug, or working part, fits exactly into the working face of the die. The size of the plug is smaller than the hole in the die. In the process of drawing the inner contour of the die will determine the outer diameter of the tube, the surface of the mandrel its inside diameter and the orifice between die and mandrel its wall thickness.

It might be asked why drawing operations are necessary. As mentioned before, the dimensions and tolerances of a tube are, to a certain extent, rather dictated by the particular manufacturing process than by the customers' requirements or the purpose for which the tube is meant. In particular, this holds good as far as the wall thickness and its relation to the diameter is concerned; but it is also true with respect to the tube length. So, whenever the requirements call for smaller diameters, thinner walls, greater lengths and closer dimensional tolerances a tube must be drawn. Tubes must also be drawn when the quantity ordered is too small to justify a hot mill run of seamless tubing or to allow a change of the set of rolls for welded tubing, even though the manufacturing process employed might permit the production of a certain given dimension and its facilities would make it practicable.

Drawing becomes often necessary when a better surface finish is required, although, if practicable, it always proves cheaper to give the high surface quality to a flat surface, as in the case of autogenous welding to the strip of which the tube is then made.

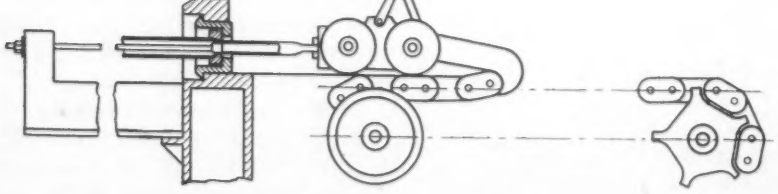
Drawing is further required for tubes with odd or special shapes. Rather simple forms such as square, rectangular, oval, hexagonal, elliptical and similar shapes of tubing, however, are made in one single pass from a round tube, immediately after the welding operation, in a so-called Turk's Head that holds the die rolls by which the shaping is done.

Lastly, tubes are cold drawn in order to bring out certain physical properties, such as higher tensile strength or elasticity.

Drawing consists of the following cycle of operations: (a) Pointing the end of the tube by means of a hammer or swedging machine so as to permit its insertion into the die and to provide a grip for the pliers on the draw bench; (b) pickling to remove any scale or dirt detrimental to the surface of the dies; (c) washing; (d) dipping into a lubricant, known as "dope"; (e) the drawing operation proper, and (f) annealing in order to meet the physical requirements of the finished tube or, by way of an intermediate operation, to soften the material preparatory to an additional drawing. Nowadays this is done within a controlled atmosphere, with the exclusion of oxygen in order to prevent any scaling.

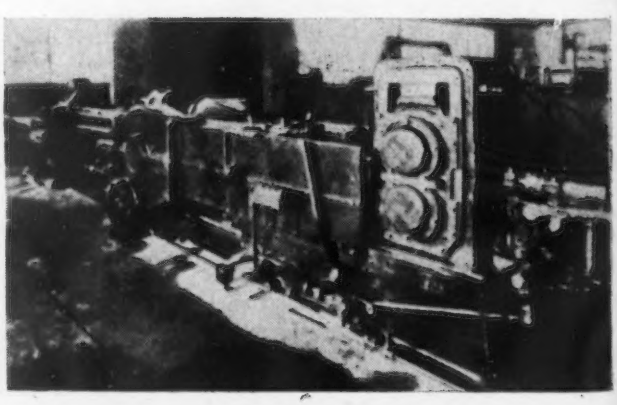
It is apparent that this cycle of operations, which is called "one pass," does not only result in a great loss of material (in a major degree due to repeated pointing and pickling), but also requires great manpower. These are reasons that suggest that this operation should possibly be avoided or reduced to the necessary minimum. In this connection, the disadvantage in the use of the cheaper hot rolled strip, where a high surface quality or close tolerances are called for, must be pointed out again. For the subsequent drawing and polishing operations that become necessary will far outweigh possible savings in the use of cheap raw material. In most cases, however, repeated drawing operations are unavoidable. The making of a hypodermic needle, for instance, requires not less than 35 drawing operations.

The drawing process has been much improved. Among such improvements



ABOVE

FIG. 33 — Schematic presentation of cold drawing with dies and mandrel on the left and tongs and draw chain on the right.



RIGHT

FIG. 34—Tube reducing machine with reciprocating saddle containing the reducing dies shown at the right. Tubing is fed into the machine at the far end.

—Development of an Industry

o o o

By DR. BERNARD P. PLANNER

o o o

. . . In concluding this three-part article, the advantages of drawing and procedures in the drawing cycle are given. The Rockrite process which utilizes compressive rather than tensile stresses to accomplish reduction is also described.

might be mentioned the lengthening of the draw bench, the increase of the drawing speed, double action draw benches that allow the handling of two strands of tubes by only one man and, above all, the introduction of the tungsten carbide die.

Use of Tungsten Carbide Dies

Tungsten carbide dies are made of sintered and highly compressed mixtures of tungsten carbide with titanium and sometimes tantalum carbide powders, embedded in a matrix of cobalt. Only due to the development of these dies, which combine extreme hardness with some sort of self-lubricating quality, it became possible to obtain absolutely scratch-free tubes with a highly polished surface and exceptionally close tolerances. In many instances the making of some peculiarly shaped tubes, such as for the aircraft industry, were possible only through the use of these dies.

Where still greater precision is required than can be accomplished by drawing it may be obtained for the outside diameter by way of centerless grinding. To improve upon the inside diameter any method other than cold drawing will mostly prove too expensive for a commercial proposition.

In realization of the fact that none of the other operations, which together constitute a drawing cycle, can be omitted or further simplified the increase in the amount of reduction per pass became the constant objective.

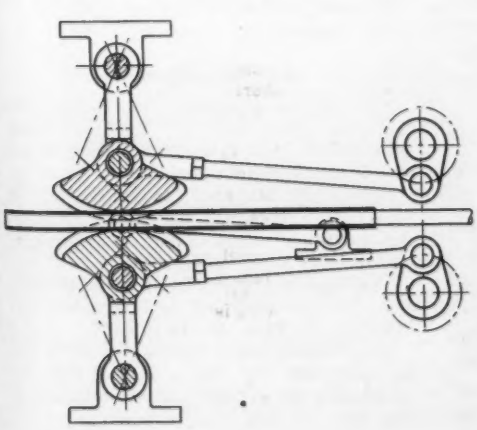
Limitations are set in this respect by the design of the die, the lubrication and, above all, the ultimate strength of the tube, that is the grade of steel worked on. For it is obvious that the reduction can only be carried as far as the ultimate strength of the tube section that is leaving the die will allow; otherwise breaking would occur. The extent of hardening in the cold drawing process varies according to the different stress sensitiveness of the various steels. The yield strength of a bessemer steel, for instance, shows an increase that is 20 per cent higher than that of an open hearth steel cold worked in the same way. The increase in tensile strength of bessemer steel is 13 per cent higher than that of an open hearth steel.

While it became possible to reduce the section area by as much as 40 per cent over a stationary mandrel, even higher values were obtained with the drawing-on-the-bar method.

It was but recently that foreign scientists attempted by a formula to determine the "maximum permissible reduction" in one single pass for soft carbon steel. Their formula contains definitions such as "average deformation strength," "deformation efficiency" and the like. These definitions need some explanation before they can be evaluated. They arrived at a "theoretical maximum reduction" of 65 per cent, yet no more than 56 per cent is said to have in fact been reached. The facts brought out in this research are hardly new, for it has been known before that the sensitiveness to cold working does greatly vary with the grades of steel. As mentioned above, bessemer steels work harden far more than open hearth steel grades, sometimes even to a degree that they can hardly be drawn. It has also been well known that certain ranges of reduction, called "critical passes," must be avoided in the drawing operation as they will cause excessive grain growth in the subsequent annealing process.

Rockrite Process

Real progress, indeed, was made with the Rockrite process (Fig. 34) that brought a fundamental change in



LEFT

FIG. 35 — Drive and working dies of the Pilger step process.

o o o

RIGHT

FIG. 36—Reducer dies used in the Rockrite process are semicircular with tapered grooves.

the method of accomplishing further reductions per pass. The purpose of this process (covered by reissued U. S. patent No. 18,329, No. 1,842,280 a.o.) is analogous to that of the cold drawing process; yet the reduction is not accomplished by the application of predominantly tensile but by compressive stresses.

The method does not appear to be new. For the Mannesmann brothers, in their search to find a suitable feeding mechanism for the Pilgers step process, developed very similar equipment in 1892. (See Figs. 22 and 35.) Instead of imparting the reciprocate movement onto the tube, the entire rolling mill was then mounted on a sliding sledge which was moved by means of crank shafts and crossheads. The process, which in part was meant for another purpose, was only used for white hot billets. Since it proved too complicated and impractical for hot working and for larger units it was soon given up.

In the writer's opinion the Rockrite process, which shows a high mechanical development, is the application of that old method to a new use. The process is employed to reduce tubing cold in the machine; the work is performed by two semi-circular dies or rolls with tapered grooves. (See Figs. 36 and 37.) A tapered mandrel, attached to a rod, is inserted into the tube and the dies rock down on, or roll over, the tube. Rocking forth and back they will thus reduce the tube with the ever decreasing cross-sections of their tapered rolls. The dies or rolls are mounted on a so-called saddle, which, in turn, rests on rollers and receives its reciprocate motion (35 to 120 strokes a min.) from stationary racks fastened to the bed.

A crosshead which grips the rear end of the tube is fed a predetermined amount (usually 10 to 22 in.) at each stroke. Upon completion of each forward movement the crosshead with the tube are turned by a given number of degrees, as a rule 60 deg. The holder with the mandrel is revolved by the same mechanism. Such a synchronization is meant to prevent a one-sided wear of the mandrel, and any existing excentricity will be eliminated by the concentric movement around the tube.

The results obtained by this process are remarkable. Aside from the fact that the pointing of the tube is superfluous and the loss in scrap far lower, reductions of up to between 75 and 85 per cent for mild steel and 60 to 73 per cent for alloy steel, are achieved. This would equal an average performance of 2 to 6 draws which are required on a bench. Also annealing between the passes is often unnecessary and as much as fifty-fold reductions (two-fold = 50 per cent), without intervening annealing, have been obtained as against less than two-fold reductions in the conventional cold drawing process.

An explanation has been sought for such strange behavior of the steel that is worked in this manner. No doubt, the cold workability of metals depends, in addition to the aforementioned factors, on the nature of the stresses applied, their amount, concentration and distribution within the metal. This is a field where our knowledge is still deficient so that extensive research should be encouraged. Photo-elastic methods may give some assistance.

E. P. Polushkin* has conducted metallographical research as to the effect of various cold working processes on the structure of steel tubes. He found that the maximum elongation of single crystals, before fragmentation set in, did not exceed 2.5 times their original lengths, no matter which of the processes had been used. Most striking, however, in the behavior of the same steel under different cold treatment methods, was the discovery that after the conventional cold drawing operation the greater part of the grains formed herringbone-like slip lines, running at an angle to the direction of drawing. Such lines must be considered as potential cracks. Tubes treated in the Rockrite process, on the other hand, proved to be comparatively free from such slip lines but showed predominantly longitudinal deformation lines (fibers) running parallel to the tube axis.

*E. P. Polushkin, "Effect of Cold Work on the Microstructure of Low Carbon Steel Tubes," Transactions A.S.M., 1933.

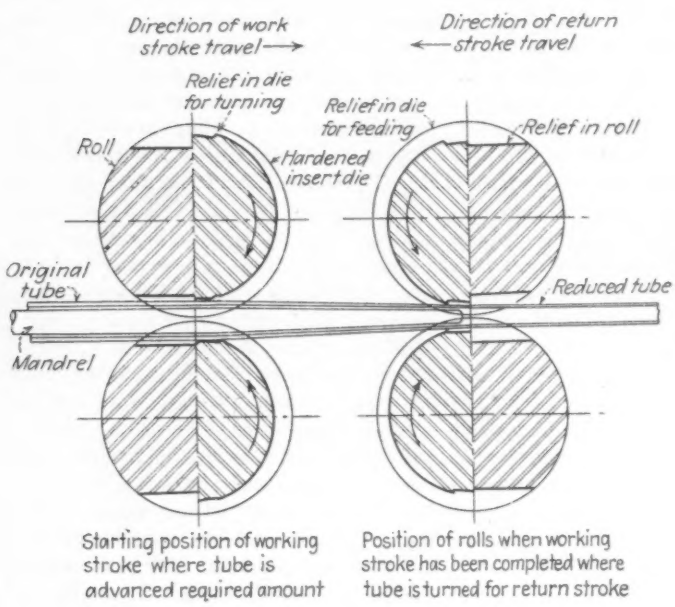


FIG. 37—Diagram showing position of reducing rolls before and after a working stroke on a steel tube.

Although this discovery might serve as an explanation, this research can hardly be called complete. A photoelastic research into the distribution of stresses would probably bring further elucidation.

As to the process itself, it represents a cold forging operation and, on account of its intermittent character, might be called a cold Pilgers step process. No matter the name, however, that might fit this process best and no matter the metallurgical explanation that will eventually be found, the extraordinary advantages of the Rockrite process, such as the extremely high reduction per pass, very low scrap losses, the lesser need for or superfluity of, annealing and pickling operations, the excellent surface finish and the very close tolerances of the tubes thus treated have been fully recognized. The process is particularly suited for alloy steels and has been successfully applied in many countries.

Acknowledgment

The writer wishes to thank the National Tube Co. (U. S. Steel Corp. subsidiary), Pittsburgh, for its permission to publish this article;

Mr. A. W. Simpson, in charge of research and laboratories, National Tube Co., without whose help this article would have been impossible;

The Tube Reducing Co. for the permission to publish the photographs and drawings in Figs. 34, 36 and 37;

The Formed Steel Tubing Institute and its secretary, Mr. H. S. Card, for the permission to publish the photograph in Fig. 28.

Exide Ironclad ease of handling means increased dependability

Complex equipment is all right in its place, but today, Industry has a big job on its hands. Tools which are simple and easy to handle, save time, money, and materials. That's why Exide Ironclad Batteries, long known for their durability and dependability, are playing such an important part in the industrial war of movement. They shorten the training periods of new workers. They save materials through their long life . . . and most of all they do a big job and do it well!

ANY WORKER CAN FOLLOW THESE EASY MAINTENANCE STEPS . . .

Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.

Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.

Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.

Record water additions, voltage, and gravity readings. Don't trust your memory. Write down a complete record of your battery's life history. Compare readings.

If you wish more detailed information, or have a special battery problem, don't hesitate to write to Exide. We want you to get the long life built into every Exide Battery. Ask for booklet Form 1982.

1. **High Power, More Production:** To get the most from any battery-powered electric vehicle, its battery must deliver good voltage, hold that voltage high, and be ready for emergency demands with a giant surge when needed. Exide Ironclads do just that.

2. **Long Life, Saves Materials:** Rugged Exide Ironclads are built to last, and save vital materials by getting maximum use from everything that goes into their making. When you buy an Exide you definitely—Buy to Last and Save to Win!

3. **Easy Maintenance Saves Labor:** Exide Ironclads are kept charged by the simplest method ever devised. With the Exide Charge Control Unit there's nothing to do but connect the battery to the charging source and turn a knob . . . a job the greenest worker can handle.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia 32
Exide Batteries of Canada, Limited, Toronto

ARMY E NAVY

Exide
IRONCLAD
BATTERIES

Assembly Line . . . STANLEY H. BRAMS

• Truck production plans for 1944 still shrouded in uncertainty . . . Air cooled auto motors obtain attention . . . Wide base rims may enlarge steel market . . . Wolverine Tube has novel plan.

DETROIT — Although schedules have been drawn and high priorities granted for components, the entire truck manufacturing program for 1944, military and non-military alike, is still in a state of uncertainty.

On the one hand, truck industry people are urging reconsideration of all requests of claimant agencies, so that the civilian vehicle program can meet or be advanced farther from its current level of about 81,000 units for 1944. On the other hand, authorities in Washington are contemplating the likelihood that the entire scope of anticipated vehicle output will have to be shaved down due to shortages of tires.

Originally 30,000,000 tires were scheduled for output in 1944, and this figure was later cut down to 21,000,000. Now it appears that there will be a deficiency of about 3,000,000 casings against this latter figure; and this bottleneck is emerging as the basic governing factor for vehicle manufacturing activity all along the line.

The military truck program of about three-quarters of a million units sought in 1944 will almost surely be reduced. Discussions are now under way in that direction in Washington's inner circles, and a cutback of as much as 100,000 jobs, perhaps 200,000, would not come as any great surprise.

This will be the last major phase of the truck program to undergo reduction. Previously Lend-Lease had reduced its 1944 requests by half, and the Office of Economic Warfare by a third.

So far the chief beneficiary of these cutbacks has been the civilian trucks authorized for the ODT. But it does not appear entirely likely now that the presently assigned 81,000 vehicles for this agency will be held firm. Even if allocations on that basis continue in force, it would seem that the tire bottleneck and the shortages of such critical components as axles, transmissions and bearings would be such as to cast a sizable shadow over the ODT outlook. The high priorities accorded these factors in the civilian truck program will avail little when they are taken to plants already scheduled to the hilt with component requirements for forward military output.

A parenthetical note should be injected to explain tire shortages in the face of increasing output of synthetic rubber. The fact is that actual facilities to build the large-size casings needed for trucks are simply inadequate to care for today's abnormal wartime demand. They are being built up as rapidly as possible, but they are lagging behind actual requirements. And some of the available rubber must certainly be allocated to an already slim supply of civilian tires on hand, unless the entire national transportation network is to skirt the edge of disaster.

SUBSTITUTE LATHE: When three 102-in. engine lathes used for sanding and polishing propeller blades were required for other work, the Grand Rapids plant of Nash-Kelvinator plant built the simple fixture above to do the job.

MEANWHILE, automotive industry interest is stirring in the direction of new small motors which are in development and experimental stages.

December saw Washington granting Henry Ford a patent on an opposed piston type of pancake engine. The design is such that a single explosion in each of four cylinders drives two opposing pistons outward. There are two crankshafts, each at one side of the engine, geared together to a single drive shaft.

Customarily such engines have been built in bolted halves; the Ford patent describes the new engine as providing easier access to valves, without the necessity of disassembling the engine.

Engineers at the Rouge declare that the Ford opposed cylinder engine shows efficiency up to 120 brake mean effective pressure, developed on dynamometer tests. Automobile engines generally average around 90 BMEP.

The horizontal opposed type of engine also makes its appearance in an aircooled version in a new ordnance vehicle, which is still in its testing stages. This unit, developed from aircraft designs, quite logically shows a much better weight-h.p. ratio than orthodox automotive engines.

Its installation in a land vehicle, even though experimental, is probably the first time that serious testing has ensued on an aircooled job since Franklin discontinued making automobiles powered with aircooled motors. In operation in the new vehicle, the engine is somewhat noisier at lower speeds than an orthodox liquid-cooled motor. But it appears to develop much more efficient characteristics at normal and higher speed ranges, not only as regards noise, but as regards economy as well. Of course, this should not be surprising, inasmuch as aircooled engines operate much hotter than their liquid-cooled counterparts, and are consequently more thermodynamically efficient.

ON the subject of post-war straws in the wind, steel companies are following with a close eye all wheel and rim developments. There are two movements on this score which might be termed major in their implications, one rebounding to the benefit of the steel makers, the other to their disadvantage.

The beneficial program is the extending indorsement of wide base rims. It has been generally realized for some time that tires have longer

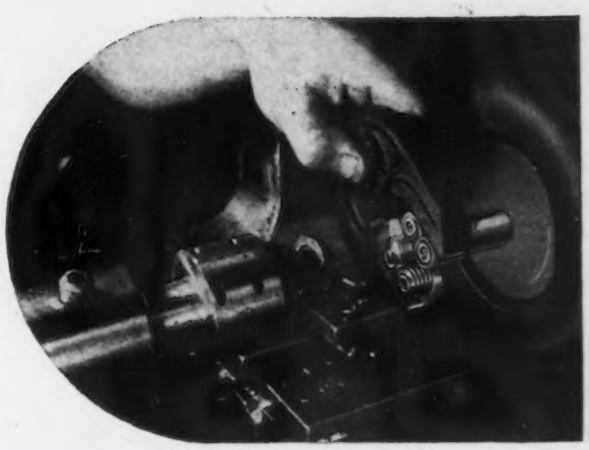
FOR "IN PROCESS" GAGING . . .

ROLL THREAD SNAP GAGES

Licensed Under Pratt & Whitney Patents

You want the gage that checks all principal causes of thread failure: errors in lead, pitch diameter, form, straightness, and out-of-roundness. That's what you get in the "*Greenfield*" No. 1625 Roll Thread Snap Gage.

Also you get speed, because of its open end construction. And long life—its rotating rolls reduce friction.



Note that when rolls, eccentric pins, and other parts do wear out, these parts as made by "Greenfield" can be used in the John-Son's type of gage made by any manufacturer.

• • •

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

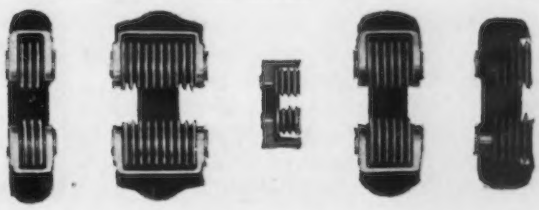
DETROIT PLANT: 5850 Second Boulevard

WAREHOUSES in New York, Chicago and Los Angeles

Get Your Copy of this Booklet Today

GET THE RIGHT STYLE FOR YOUR JOB

There are 2 general types of Roll Thread Snap Gages, and several different styles. Our descriptive booklet helps you choose the style best suited to your needs.



life when mounted on wider than normal rims, rather than nominal widths. Conversely their life is shortened when they are mounted on narrow rims. The wide base rim program has received impetus in the new tire warranty of the Rubber Manufacturers Association, whose standards eliminate narrow rims from the list of permissible sizes and experimentally sanction wide base rims, indicating unanimous tire industry support for the wide base rim program.

Wide base rims were available as optional equipment on 1942 Buicks and Studebakers and have been generally utilized for years with farm tractor tires. In view of the implied endorsement of wide rims by the RMA, it would appear logical to expect that more manufacturers will make this equipment available in post-war manufacturing.

Wide base rims require anywhere from four to 50 lb. more of metal per wheel. A wide base rim for a passenger car utilizing the commonest size, 16 by 6.00, requires approximately 4 lb. more of steel than does the nominal size rim. Wide truck rims require anywhere from 10 to 50 lb. more steel than do nominal sizes, due not only to increased width but also to heavier gages of steel required in many applications.

On another side of the picture, the steel companies do not find so happy a prospect. An engineering tendency of note in the auto industry is to consider larger tires and smaller wheels as a ride-comfort medium. The employment of jumbo size tires appears to be finding increasing adherence in automotive engineering ranks. The smaller wheels which go with such would in all likelihood more than overbalance the increased tonnage of steel required for wider base rims.

WOLVERINE Tube Division of Calumet & Hecla Consolidated Copper Co. installed a novel program of profit-sharing last week. It calls for a profit-sharing payment to the over 1,000 employees equivalent to a dividend on 50 shares of stock, whenever a dividend is declared by the company. The proposal will be retroactive to Sept. 1, which will give the employees two quarterly profit-sharings to start off with. In September a payment of 20 cents a share was authorized for stockholders, and in December 20 cents per share—making the profit-sharing payment for each employee $20 for those two periods, figured on the basis of 50-share holdings.

Controls Revised on Aircraft Materials

New York

• • • **Both material conservation** moves and relaxations of controls have highlighted recent activities of the Operating Committee on Aircraft Materials Conservation of the Aircraft Resources Control Office.

Among recent relaxations of controls, Conservation Directive No. 11 requiring contractor conservation reports was suspended effective Dec. 3. This eliminated the filing of conservation reports by contractors. Relaxation of the reporting which was requiring considerable clerical and engineering time on the part of some contractors was said to have been made possible through information from field staffs now functioning efficiently.

Another relaxation became known with the release of corrosion-resisting steels for use in aircraft fire-walls. Use of this steel was made possible through an improved supply condition but its utilization was only recommended for certain applications where manufacturing operations would benefit. A special appeal method will release contractors from the terms of Order M-126, formerly limiting the steels use in this production.

In a tightening-up procedure, the ARCO limited the use of anti-friction bearings to definte applications in specific types of planes and recommended use of alternate bearings in specific applications.

A restriction on the use of columbium bearing steels, conforming to the AN-QQ-S-757 specification, limited its use to certain specific parts of airframes and aircraft engines. The shortage of columbium, a wholly imported alloying metal, was said to have caused this conservation measure.

•

G-M Plans Diesel Parts Schedule in Steering Division

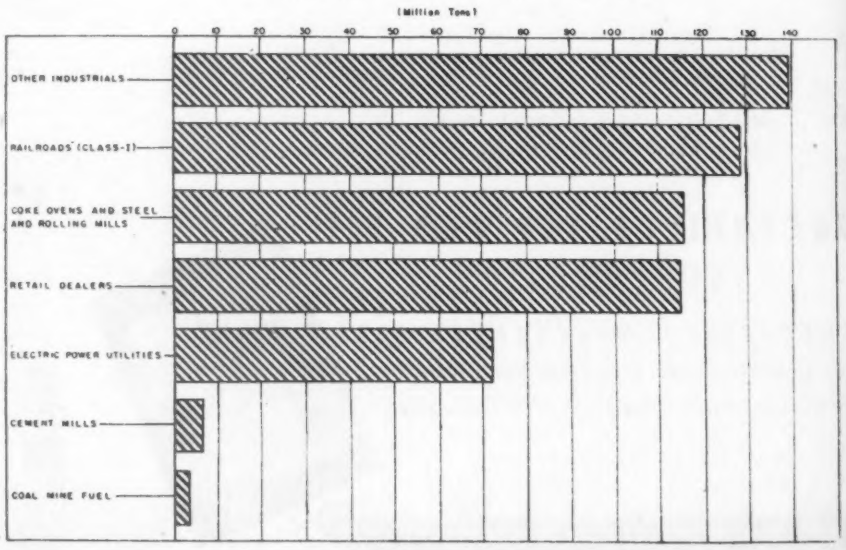
Grand Rapids, Mich.

• • • **Plans for post-war** production of diesel engine components here by General Motors Corp. have been outlined.

When the war ends the Diesel Equipment Division will be established in Grand Rapids, replacing wartime manufacture of carbines by the Grand Rapids plant of Saginaw Steering Gear Division. The new division will manufacture injectors for all General Motors diesel engines, now being undertaken at Detroit, Cleveland and LaGrange, Ill.

About 2000 men will be employed, and a new plant will be built. The general manager of the Diesel Equipment Division will be C. F. Runchey, now manager of the Grand Rapids plant of Saginaw Steering Gear. Chief Engineer will be C. W. Truxell of the engineering staff of the Detroit Diesel Engine Division. A Detroit staff of technical and production men will supervise the plant.

CONSUMPTION OF BITUMINOUS COAL BY CLASSES FOR A RECENT TWELVE MONTH PERIOD



Washington . . . .

L. W. MOFFETT

• Worst in transportation crisis looms . . . Flat rolled steel shortage poses new equipment problem . . . More freight cars, passenger cars, rails and trucks asked by ODT.

WASHINGTON—ODT Director Joseph Eastman predicts that the worst is yet to come in the nation's transportation problems. Hence production of transportation equipment replacements for 1944 as approved by his office and WPB will place an even heavier load on the nation's steel mills, particularly for flat rolled products. If this program is fully met it should greatly ease the transportation crisis next year.

Replacements in transportation equipment have been very limited and even with increases authorized for next year will not approach prewar normalcy. In commemorating ODT's two years of existence Mr. Eastman recently said that trucks were the hardest hit in the matter of replacements, but that the railroads also face serious problems of maintenance and manpower. The flow of materials to the railroads has met minimum wartime requirements for essential maintenance, except for rail and track accessories, but it has not been sufficient to prevent deterioration of their plant, according to ODT.

One of the problems confronting the railroads is the replacement of freight cars. ODT says that some 30,000 freight cars have been produced this year, as compared with an average annual production of 48,000 during the five years ended Dec. 31, 1941, but it is expected that the total for 1944 will be substantially larger.

WPB has already authorized some 50,000 freight cars for production in 1944. Orders have been placed for a large portion of this equipment. This allocation includes gondolas, hopper cars, flat cars, boxcars and cabooses, all badly needed by the railroads.

It should be pointed out that production of railroad equipment of all types has been high, but large amounts of it have been going to fill Lend-Lease requirements. A considerable amount of the United States' boxcar production is going to Russia. This is also true of locomotive output.

Actual deliveries of freight cars for the period Jan. 1, 1942, to Oct. 1, 1943, were approximately 84,000 cars of all types. The WPB production program for this period was considerably higher. Cars that were not produced in 1943 will be carried over and included in the 50,000 domestic car program for next year.

UNTIL recently railroad companies were reluctant to order all of the cars authorized by WPB. Since the five-year amortization power has been placed in the hands of WPB Chairman Donald Nelson it is believed that about 10,000 cars which had not been ordered from the 1944 allocation will be quickly seized by the railroads. This will enable the companies to deduct one-fifth of the cost of this equipment each year for a five-year period.

The production of composite freight cars has been junked by WPB, but Mr. Eastman predicted that steel cars would not go into production until mid-1944. Of the 50,000 total 30,000 are to be steel cars. It is also expected that some alloy steel will be available for the 1944 program.

Mr. Eastman's prediction is a far-sighted one, for with a tight situation in plates and sheets still existing, only a definite easing of this shortage, due to military production shifts, or a reallocation will provide any for railroad cars until the second half of 1944.

Although WPB programs generally fall short of their goal the 50,000 cars may be produced, because of the easing of the materials situation and better control over scheduling, according to ODT.

No new passenger cars, other than troop sleepers and kitchen cars, were built this year and only a very limited number in 1942. It is hoped, however, that some new passenger equipment will be authorized for 1944, Mr. Eastman said. He added that due to the apparent over-supply of aluminum some aluminum passenger cars may be turned out next year.

The situation in regard to locomotives appears a little brighter. Even though some 800 new locomotives were delivered this year—about twice the annual average for the five years ended Dec. 31, 1941—the current demand for locomotives has not been met.

Contributing to this brighter outlook is the fact that WPB has placed locomotives for domestic use on an equal priority with military locomotives, and has said that it would render priority assistance to locomotive builders for as many as they can turn out.

The easing of alloy steels will once again permit their use in locomotives. Carbon steel has been used for some time and has added to the weight as well as cutting down efficiency.

IT it also expected that a minimum of 2,000,000 net tons of rails will be delivered in 1944. The railroads received approximately 1,260,000 tons in 1942 and deliveries are expected to total about 1,485,000 tons for this year.

Since ODT has predicted that freight traffic will rise 3 per cent in 1944 over this year, and rail travel will jump 15 per cent, it is of the utmost importance that all of this equipment be produced if any degree of safety is to be retained in the operation of the railroads.

Equipment for the nation's truck transport system has deteriorated at an even faster rate than that of the railroads, and replacements have been proportionately fewer.

WPB has authorized the construction of 80,000 civilian trucks in 1944. This is less than one-fifth of the normal prewar replacement production of 450,000 vehicles annually, says ODT.

The truck production program for 1943 failed so badly that WPB will not release the actual production figures. For example, of 7500 trucks

SUNICUT

Increases Tool Life 20% . . . Produces Better Finish

Prolonging the useful life of tools has become a wartime duty as well as "good business" . . . and a major factor in determining tool life is the cutting lubricant. Many metal working shops have discovered that SUNICUT, the clear, free-flowing oil, not only improves the finish and decreases costs . . . but also adds valuable hours to the life of cutting tools.

In one large New England plant, engaged in vital war production, a change to SUNICUT on their multiple-spindle, automatic screw-machines resulted in an increase of 20% in tool life — helped them get as much work out of every five tools as they previously obtained from six. They secured an average run of 8 hours between tool grindings. Down-time was reduced . . . production was increased . . . and the finish was greatly improved.

Such results, and even better, are not uncommon for plants which have switched to SUNICUT . . . the transparent, sulphurized cutting oil with exceptionally high metal-wetting and heat-absorbing qualities. For proof of what SUNICUT can do in your shop call in a SUN Oil Engineer. Write . . .

SUN OIL COMPANY · *Philadelphia*

Sun Oil Company, Limited, Toronto, Canada

SUNOCO

SUN INDUSTRIAL PRODUCTS *HELPING INDUSTRY HELP AMERICA*

scheduled for production in the fourth quarter only a little over 300 have been delivered.

ODT Chief Eastman says that the 80,000 trucks were all that ODT requested for 1944, but that they were not all that he would like to see. He also said that in making their request ODT had to consider what it was possible to produce. Military demands for trucks have been constantly increasing and cutting into civilian programs. Military and civilian trucks now have equal priority and any cutbacks will be shared equally.

Civilian truck production was gone into half-heartedly in the past, but now WPB has lifted all restrictions on the uses of certain kinds of metal in components, to get these trucks produced.

Since steel officials predict that the flat rolled product bottleneck is to be broken by mid-1944 the present tight situation should not affect the truck program, as most of the trucks are scheduled for the second half of the year.

o o o

Railroad Stock, Bus and Truck Production to Increase in 1944

Washington

• • • **In a statement** issued Dec. 20, ODT Director Joseph B. Eastman gave figures on expected increases in the production of transportation equipment in 1944.

Rails: 2 million tons minimum, compared with 1.5 million tons in 1943 and 1.3 million tons in 1942.

Freight cars: 30,000 in 1943, compared with an average of 48,000 per year before the war; 1944 expected to be "substantially higher" than 30,000.

Passenger cars: Some "hoped for" in 1944; none produced in 1943, very few in 1942.

Local buses: 7,000 scheduled for production in 1944; 3,000 authorized for 1943, of which fewer than 1,000 were actually manufactured.

Trucks: Situation remains as previously reported—123,000 scheduled in 1944 of which 80,000 are for civilian use; of the 7,500 authorized for 1943, only a few hundred have been delivered.

The easing of the critical materials situation is expected to make the authorized production feasible; more important is the fact that civilian requirements have been scheduled on the same basis and with the same priority ratings as comparable items intended for military procurement, thus promising to avoid repetition of this year's situation in which the civilian schedule was not fulfilled due to the pushing of military demands ahead.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

Union Members Must Pay Up Dues to Quit

Cleveland

• • • **Union members must be paid up in their dues before they can exercise an opportunity to withdraw from a union during a new escape period included in the renewal of a maintenance of membership clause. This was the ruling of the Fifth Regional War Labor Board in Cleveland in its first decision involving renewal of a maintenance of membership clause.**

Chairman Lewis M. Gill, in a written opinion, said: "He should not be allowed to cast off the obligation for the ensuing year without having first carried out his obligations for the past contract period. In this way we have safeguarded the union against the possibility that some of its members may have neglected to pay their dues under the contract with the expectation of getting out from under the obligation free of charge during the escape period when the contract is renewed."

Production Data Revealed for Iron and Steel in Spain

• • • **The shortage** of coal and the cutting off of imports has hampered heavy industries in Spain, according to the *Iron and Coal Trades Review*, which listed the production figures, below, for iron and steel and ore, compiled from official Spanish sources. After great effort, 10,302,433 tons of coal was mined in 1942, the publication states.

	Spain Metric Tons	Viscaya Metric Tons
Iron Ore—		
1941	1,640,686	982,662
1942	1,670,370	778,516
4 mos., 1943	514,060	.....
6 mos., 1942	.....	375,397
6 mos., 1943	.....	370,515
Pig Iron—		
1940	625,918	423,482
1941	536,865	331,885
1942	528,117	323,322
6 mos., 1943	266,095	157,820
Steel Ingots—		
1940	654,896	480,112
1941	681,304	398,872
1942	627,750	366,340
6 mos., 1943	334,070	195,590

"PUT IT ON THE BLANCHARD"

These heat treated steel trunnion bearings are ground on a No. 16-A2 Blanchard Surface Grinder.

They are loaded on special 80-station fixture with magnetic studs locating from previously ground surface. The end of the bearing is then ground to very close limits. At the unloading station the work is automatically ejected and demagnetized.

.005" to .015" of stock is removed, to limits of ± .0005". 18,500 pieces are produced per 8 hour shift.

Grinding Trunnion Bearings on No. 16-A2 Blanchard Surface Grinder.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ Production
- Adaptability
- Fixture Saving
- Operation Saving
- Material Saving
- ★ Fine Finish
- ★ Flatness
- ★ Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*

BLANCHARD

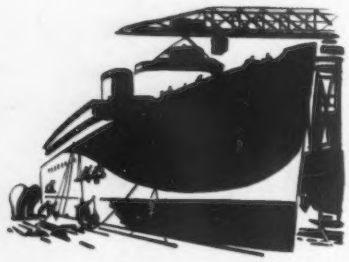
The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

WEST COAST . . . OSGOOD MURDOCK

• With manpower, materials and facilities problems generally under control, the Pacific Area faces difficult months in rail transportation, port and terminal traffic, fuel and service trades affecting all civilian activities.



SAN FRANCISCO—As the industrial far West, with its eyes and thoughts predominantly on the Pacific, enters its third war year, what principal problems may be crossed off the list and what other problems appear most prominently for future wrestling?

Within the last two months industrial manpower, though still tight and stretched taut, has stabilized, with better utilization, so that direct war industries are well over the hump. Hotels, restaurants, transportation and employers of unskilled, routine and service labor are still desperately undermanned and have little relief in sight for many months.

Materials generally are better available and warehouse and supply stocks have been converted from peacetime to wartime quantities and inventories, to reduce emergency expediting to a minimum.

Facilities are pretty well installed, and with the exception of the Geneva Steel plant in Utah, a major military project in central Washington and certain terminal, port and Naval repair facilities, the war plants may be said to be generally complete. "We'll play these" say the players, both civilian and military.

Human and personal factors have been solved to an important degree. Industrial relations are probably in better equilibrium than they have ever been. Management and labor in general now understand each other under war conditions and respect each other's duties, rights and obligations. Moreover, management and superintendence have shaken down and been seasoned by actual operating experience, to become more adequate, self-reliant and strengthened in morale and team play.

"BEAT Transportation" yell the rooters instinctively if you want to know the "natural enemy" in the biggest battle to come. Most shippers and traffic men have been expecting and still expect some rationing plan for freight and passenger, rail, bus and truck transport. Fuel is short, equipment is wearing out, loads constantly increase and the big Pacific Push operations are ahead.

Figures from the Bureau of Statistics and Economics of the Interstate Commerce Commission for three of the four principal trans-continental carriers supplying California indicate that the month of October reached an all time peak in rail freight traffic. For the year 1941, these three systems combined to haul 9,965,000 gross ton miles of freight per month. For 1942 they averaged 12,587,000 gross ton miles monthly. For the first eight months of 1943 they averaged 13,777,000 gross ton miles per month. But in the month of October they hauled 15,188,000 gross ton miles. All four trans-continental systems serving California (Southern Pacific, Union Pacific, Western Pacific and Santa Fe) have increased their loaded car miles this year 25 per cent over 1942 and 66 per cent over 1941. And the Pacific Push is still ahead.

Increases in locomotives and freight cars would help to some extent in maintaining this volume for the future, but it is questionable whether much greater volume by rail can be obtained. Experienced additional manpower is not available and even present workers are becoming fatigued from consistent overtime stretches and 60-hr. weeks. Terminals, classification yards, single track bottlenecks, passing tracks and other limiting factors indicate that October 1943 traffic may well be accepted as maximum. For the Pacific Push, therefore, either non-essential or avoidable freight and passenger traffic must give way to most essential, through rationing, priorities, and allocations, or considerable and extensive resumption of inter-coastal ocean traffic through the Panama Canal must be conceived. Because there are only two primary ports on the entire West Coast, San Francisco Bay and Pudget Sound, and three major secondary ports, Los Angeles harbor, the Willamette-Columbia River, and San Diego Bay, and because dock, transit shed and general port terminal facilities at all these points are stretched to the utmost already, for direct trans-Pacific military supply, repair and service operations, it is doubtful whether inter-coastal shipments could be resumed effectively, to help a complicated war traffic system developed these past two years by necessity and operating with such close-timed precision.

NEXT to transportation will be the warehouse problem. The entire area west of the Rocky Mountains is saturated now, for stocks, warehouse, terminal and transit shed facilities. Increased circulation and turnover seem to be the only relief for the future, dependent upon many more ships and more rapid and precise handling, receiving and shipping schedules.

Petroleum fuel is generally expected to be more and more difficult this coming year. Civilian and public transportation depend predominantly upon buses and private automobiles, and gasoline reserves are constantly shrinking as raw crude is diverted for aviation, diesel and Naval fuel. Realistic observers predict that the hardest problems and worst humps are ahead for private and inter-urban transportation.

Housing continues desperately difficult, but the incidence has probably shifted from war plant and industrial workers to the problems of travelers, casual military personnel and civilians. Increasing numbers of Army and Navy men returning from battle or combat areas, either on furlough or after being hospitalized, find it difficult to move about or spend a night outside their accustomed military and naval establishments.

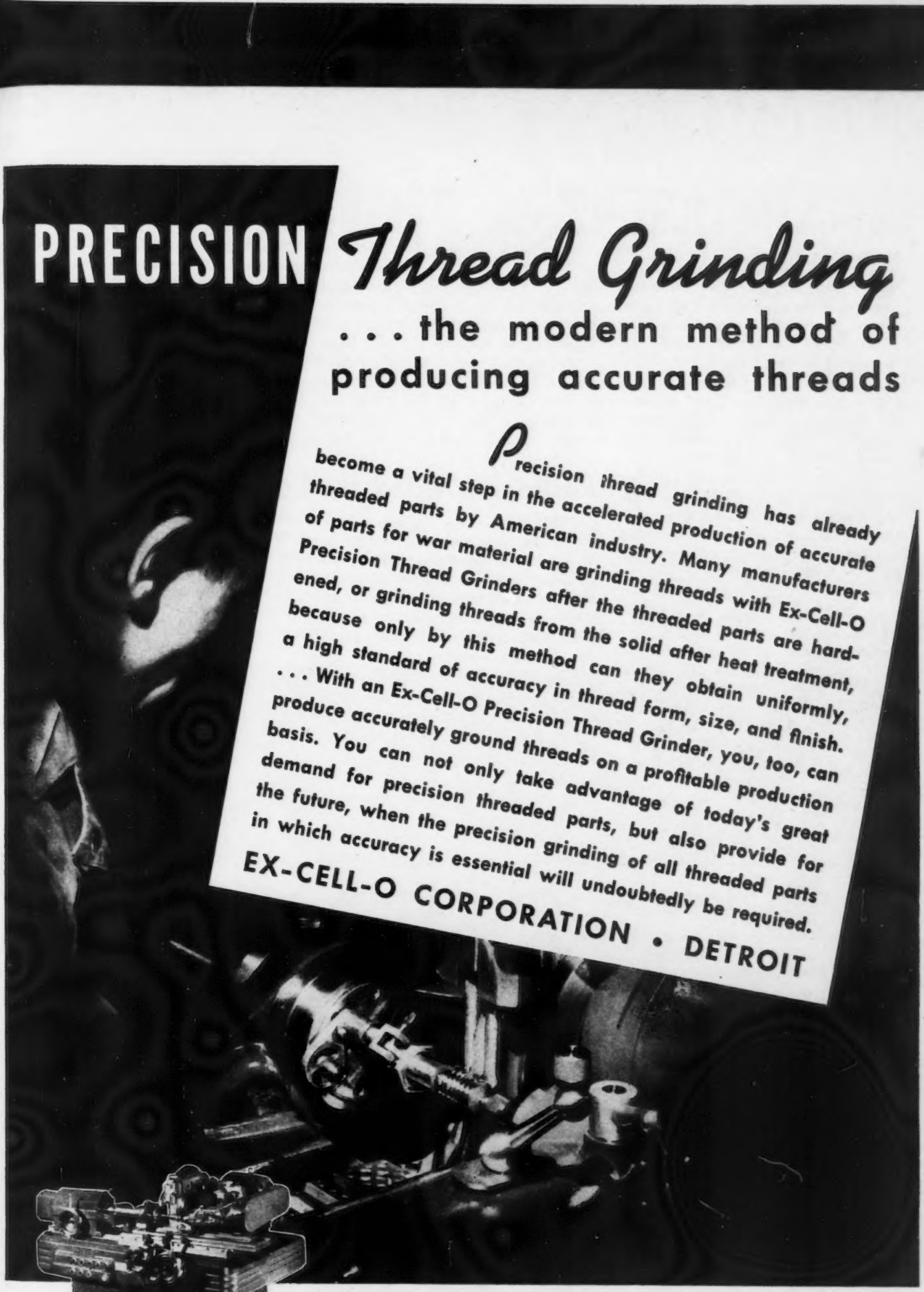
PERHAPS most difficult is the general problem of fatigue, overtraining, boredom and sagging morale. The thrill, novelty, and glory fade. The battle, danger and heroics are far

PRECISION *Thread Grinding*

. . . the modern method of producing accurate threads

Precision thread grinding has already become a vital step in the accelerated production of accurate threaded parts by American industry. Many manufacturers of parts for war material are grinding threads with Ex-Cell-O Precision Thread Grinders after the threaded parts are hardened, or grinding threads from the solid after heat treatment, because only by this method can they obtain uniformly, a high standard of accuracy in thread form, size, and finish. . . . With an Ex-Cell-O Precision Thread Grinder, you, too, can produce accurately ground threads on a profitable production basis. You can not only take advantage of today's great demand for precision threaded parts, but also provide for the future, when the precision grinding of all threaded parts in which accuracy is essential will undoubtedly be required.

EX-CELL-O CORPORATION • DETROIT



To the left: Ex-Cell-O Style 31 Precision Thread Grinder (this is one of nine styles of Ex-Cell-O precision thread grinding machines).

Precision THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT PURE-PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

XLO

EX-CELL-O *for* PRECISION

away. As tension in the European theatre and even in the Eastern and Midwestern sections of the United States relax and decrease, the Pacific area faces its greatest task and most severe privations. Most difficulties will be borne heaviest by civilians and inconspicuous persons.

To thoughtful citizens and observers on the West Coast, the prospect for the coming year is neither encouraging nor attractive. Difficult days are ahead.

In fact there seems to be increasing consciousness among increasing numbers of the civilian population that the big job is yet to be done and that each must carry and man his weapon, however humble it may be.

TYPICAL, perhaps, of reactions by organized groups to these general conditions were two separated instances last week. In the Pacific Northwest, 5000 union molders and foundry workers, members of major locals at Portland, Seattle, Tacoma and Everett voted 10 to 1 to remain on the job pending War Labor Board reconsideration of demand for wage increases. There are 7500 affected foundry workers in 77 plants in all Oregon and Washington. Over a month ago these same workers voted 2942 to 484 in favor of a strike if demands for an 8c. per hr. wage increase for journeymen and 7c. for helpers were not met.

On the other hand, a newly formed local of the United Federal Workers of America at Sacramento belligerently inquired of local Federal agencies what plans they had for employing 2500 workers to be laid off at a local air field. It seems increasingly evident to personnel and industrial relations authorities that social security begins at home and that most urgent future demands for protection, benefits, job security and guaranteed employment may come from Federal workers and union organizers, stewards and "research assistants."

o o o

Railroads Aided by Construction Grant

Washington

• • • To facilitate the carrying out of numerous relatively minor construction projects necessary in the wartime operation of railroads and other transportation systems, the War Production Board today issued an amended version of Preference Rating Order P-142. In effect, the amended order permits operators to obtain $2,500 worth of material for such minor construction projects under the procedure applicable for maintenance materials.

For construction permitted by or authorized under Order L-41, operators of transportation systems may now obtain materials costing up to $2,500 for any one project (exclusive of labor) under P-142, or may withdraw materials up to this amount from their inventory. This amount was previously limited to $500. Materials in excess of $2,500 in value may be withdrawn from inventory after the project has been authorized (Form WPB-617). Replacements for inventory above the $2,500 limit are obtainable by using the ratings assigned to the project (currently AA-3).

. . . Cited for Awards . . .

Albro Metal Products Corp., Bronx, N. Y.
Amarillo helium plant, Bureau of Mines, Amarillo, Tex.
American Bridge Co., Ambridge plant, Ambridge, Pa.
American Chain & Cable Co., Inc., Hazard Wire Rope and American Cable division, Wilkes-Barre.
Brown & Bigelow, war production division, St. Paul.
Bryant Electric Co., wiring device division, Bridgeport.
Caird Engineering Works, Helena, Mont.
Diamond Power Specialty Corp., Detroit.
Dodge Steel Co., Philadelphia.
E. J. Electric Installation Co., Jeffersonville, Ind.
Exell helium plant, Bureau of Mines, Amarillo, Tex.
Joseph W. Greathouse Co., Louisville, Ky.
I-T-E Circuit Breaker Co., Philadelphia.
Masland Duraleather Co., Philadelphia.
Michigan Wheel Co., Grand Rapids.
Midwest Steel & Iron Works Co., Denver.
Moeller Instrument Co., Richmond Hill, L. I.
Morse Chain Co., Ithaca, N. Y.
United States naval ordnance plant, Indianapolis; Pratt & Whitney aircraft division, United Aircraft Corp., Southington, Conn.
The Prest-O-Lite Co., Inc., Speedway, Indianapolis.
Respro, Inc., Cranston, R. I.
Riverside Steel Co., Martins Ferry, Ohio.
Rockbestos Products Corp., New Haven.
Standard Machinery Co., Cranston, R. I.
Thompson-Kissel Co., Jeffersonville Boat and Machine Company plant, Louisville.
Trageser Copper Works, Maspeth, L. I.
United Cork Companies, Jeffersonville, Ind.
Warsaw Elevator Co., Warsaw, N. Y.
Welin Davit and Boat Corp., Perth Amboy, N. J.
Western Pipe & Steel Co. of California, Los Angeles.
Worth Steel Co., Claymont, Del.
Clark Tructractor Division, Clark Equipment Co., Battle Creek, Mich. (white star).
Conco Division, H. D. Conkey & Co., Mendota, Ill.
Crown Iron Works Co., Minneapolis.
Grapho Products, Inc., Shell Plant, Indianapolis.
Pfaudler Co., Rochester, N. Y.
Weyerhaeuser Timber Co., Willapa Harbor Lumber Mills, Raymond, Wash.
White Star Lumber Co., Whites, Wash.
American Ironing Machine Co., Algonquin, Ill.

MARITIME "M"

J. A. Jones Construction Co., Inc., Brunswick Yard, Brunswick, Ga.
St. Johns River Shipbuilding Co., Jacksonville, Fla.
Colonial Foundry Co., Louisville, Ohio.
C. Lee Cook Mfg. Co., Inc., Louisville, Ky.
Dohrmann Hotel Supply Co., San Francisco.
Stearns Co., Chicago.
Los Angeles Steel Casting Co., Los Angeles.
Monarch Forge and Machine Works, Portland, Ore.
Wickes Boiler Co., Saginaw, Mich.
Concrete Ship Constructors, National City, Cal. (star).
Delta Shipbuilding Co., Inc., New Orleans (seventh gold star).
Houston Shipbuilding Corp., Houston, Texas (eighth gold star).
Ingalls Shipbuilding Corp., Pascagoula, Miss. (star).
Southeastern Shipbuilding Corp., Savannah, Ga. (star).
Air Pre-Heater Corp., Wellsville, N. Y. (star).
Air Reduction Co., Inc., New York (star).
Bevis Machine Co., Middletown, Ohio (star).
General Cable Corp., New York (star).
Ingalls Iron Works Co., Inc., and **Birmingham Tank Co.**, Birmingham (star).
Lynchburg Foundry Co., Lynchburg, Va. (star).
Martin-Parry Corp., York, Pa. (star).
Pennsylvania Range Boiler Co., Philadelphia (star).
Reading-Pratt and Cady Division of American Chain and Cable Co., Inc., Philadelphia (star).
Union Metal Mfg. Co., Canton, Ohio (star).
Watkins, Inc., Wichita, Kan. (star).
Westinghouse Electric and Mfg. Co., Merchant Marine Division, Philadelphia (star).
American Locomotive Co., Dunkirk, N. Y. (second star).
Cooper Bessemer Corp., Mount Vernon, Ohio, and Grove City, Pa. (second star).
Davis Engineering Corp., Elizabeth, N. J. (second star).
Enterprise Wheel and Car Corp., Bristol, Va. (second star).
Erie Forge Co., Erie, Pa. (second star).
Federal Telephone and Radio Corp., Newark, N. J. (second star).
A. P. Green Firebrick Co., Mexico, Mo. (second star).
Homestead Valve Mfg. Co., Inc., Coraopolis, Pa. (second star).
Isaacson Iron Works, Seattle (second star).
M. W. Kellogg Co., Jersey City (second star).
Linde Air Products Co., New York (second star).
Minneapolis-Moline Power Implement Co., Minneapolis (second star).
National Supply Co., Springfield, Ohio (second star).
Production Engineering Co., Berkeley, Cal. (second star).
Russel & Erwin Mfg. Co., New Britain, Conn. (second star).
Security Engineering Co., Inc., Whittier, Cal. (second star).
Selby, Battersby & Co., Philadelphia (second star).
Tube Turns, Inc., Louisville (second star).
Western Hardwood Lumber Co., **P. J. Walker Co.**, Los Angeles (second star).
Whitin Machine Works, Whitinsville, Mass. (second star).
Wickwire Spencer Steel Co., New York (second star).
Wilson-Snyder Mfg. Division of Oil Well Supply Co., Braddock, Pa. (second star).
Young Iron Works, Seattle (second star).

ELIMINATE SHOCK-LOAD PROBLEMS

with this HydrOILic FLUID MOTOR FOR ROTARY POWER NEEDS

A unique *floating drive* eliminates all mechanically linked or universal type drive rods in this HydrOILic Fluid Motor.

It ends shock-load problems, permits sudden stops, starts and reversals without danger of damage or distortion, and provides *stepless* speed variation in either direction. Yet positive driving contact is always maintained between the motor's *driving* and *driven* elements, preventing destructive backlash.

Ingenious axial-piston designing makes HydrOILic Fluid Motors completely self-starting, from any position. There are no dead-center stopping points.

Maintenance requirements have been "cut to the bone!" All ball bearings are of *standard commercial type*, easy to replace if long, hard service makes it necessary. All working parts operate in a bath of oil — no external lubrication is ever necessary. Even if slight wear should eventually occur between the port-plate and piston-cylinder, full efficiency can be restored quickly by lapping the faces of these easily-removed parts.

For indexing, hoisting, conveying and turntable requirements — and all related rotary power needs — write for details on HydrOILic *Floating Drive* Fluid Motors. The DENISON Engineering Co., 1158 Dublin Rd., Columbus 16, Ohio.

Fatigue Cracks . . . BY A. H. DIX

And Never a Wrist Watch

• • • Speaking of a certain difficult operation, the chairman at a recent technical society meeting wisecracked, *"It is harder than selling a double-breasted suit to the holder of a Phi Beta Kappa key."*

A later speaker, who came in after the chairman made this remark, managed to unbutton his coat in the course of his oration, and fiddled with his watch chain, from which dangled you know what.

To the mystification of the speaker, who was discussing the less humorous aspects of induction heating, the audience howled.

Note on "G" String

> You apply the label "Luce Terminology" to Fortune's statement ". . . the open hearths rear their gaunt chimneys to the sky . . ."
>
> We used to sit on the wall outside the Homestead Works on hot summer afternoons and anxiously watch the stacks or chimneys of the open hearths to learn in advance how many furnaces were going to tap on our three to eleven turn.
>
> —*Wm. H. H. Ginder, Jr. (Reader No. 18) Carnegie-Illinois Steel Corp., Pittsburgh,*

We said "an open hearth has hardly any more chimney than Ann Corio has drapery at the beginning of the fourth chorus." When performing in chaste Manhattan Miss Corio's drapery is wispy rather than absent. Open hearth stacks are wispy rather than gaunt. We think the *Fortune* writer mistook blast furnaces for open hearths.

Less Than Meets the Eye

• • • Our ears are in a position of permanent perpendicularity to our skull the better to catch even the faintest whisper concerning the fare set before you each week. Whether you praise or scold, your every judgment is weighed by the cooks.

But this comment, sent us by a certain works manager with regard to a recent article, we don't know whether to file in the bouquet or squawk folder:

> It is certainly composed in a very commercial understanding.

To be on the safe side we are sending him a "no-question-about-it-you-hit-the-nail-on-the-head" acknowledgment and are placing the letter in the double-talk folder.

Plug

We like people who come out bluntly and say, as does the general manager of a Kentucky manufacturing concern:

> We could not conduct our business without The Iron Age.

Aptronym

• • • R. Raymond Kay, your tireless Southern California reporter, sends us a clipping from a Los Angeles newspaper headed *"Wife Asks Decree on Intemperance."* The husband's name is Clyde W. Beerup.

Sauerkraut Is Still Sauerkraut

> I notice that the address of W. B. Coleman, secretary of the American Foundrymen's Association's Philadelphia chapter is 9th St. and Rising Sun Ave. Don't you think the latter name should be changed?
>
> —*D. R. J.*

We saw in the paper the other day that a radio network had changed a song in which the phrase "rising sun" appeared, to "shining sun." In this war, however, there has been a gratifying minimum of this kind of puerile patriotism, indicating that we have come a long way toward mental adulthood since the last war.

There is no movement to call Japanese beetles "victory beetles" nor German measles "liberty measles." Japanese maples are still Japanese maples, and if a rock comes through your window when you give out with the "Evening Star" from *Tannhaüser*, it will be due to the quality of your baritone rather than the choice of song.

"Rising Sun Avenue" is a pretty and poetic name and we are against changing it to MacArthur Boulevard.

Eye Arrester

• • • The Second Front? It Starts at Your Scrap Pile—*American Rolling Mill Co.*

Space Saver

• • • Experts in cable-ese save words by prefixing verbs with "un"—unshipped, unapproved, unfound, unwelded, and so on. Your favorite family journal's new *multum in parvo* department, "Briefly Told —," employs this space-saving technique:

> Signing of a government contract for driving of a 17,300-ft. drainage tunnel to unwater vast flooded metal resources in the Leadville, Colo., zinc-lead area was announced. . . .

Expect more of this. The WPB has just cut publications' paper allotment another 15 per cent.

Laconic Picture

> Your half-baked crack criticizing someone for captioning a picture "A laconic soldier . . ." will probably get you into your usual jam that crops up when you try to pontificate. Tell me more about the soldier. How tall was he?
>
> I ask because my dictionary, which was not bought in a drugstore, gives one definition of laconic as "short."
>
> —*Deac*

Short in speech. A man may be short in stature and be unlaconic. Costello, for instance.

The Rest Was Silence

• • • Or take the taxi driver who conveyed us last week from your favorite family journal's Washington office in the National Press Building to the Union Station. We had been bearing a lot about talkative Washington taxi drivers, who would tell you at the drop of a hat what General Marshall said to Secretary Stimson about the Norwegian Coast the last time he took them from the White House to the Hill.

To get him started we asked him the time. He didn't say. Then we said, "It looks like snow." He neither confirmed nor denied this. We made several other attempts to change the monologue into a conversation, but did not succeed until we reached the station, when he said, "Forty cents." He was laconic.

Comic Section

• • • Jack Williamson, of the Sault Ste Marie *Daily Star*, asks if we can use an iron and steel joke. A man says he and his wife are in the iron and steel business. She irons and he steals.

Can't use it. Our specifications keep us below a corn content of 12.50 per cent.

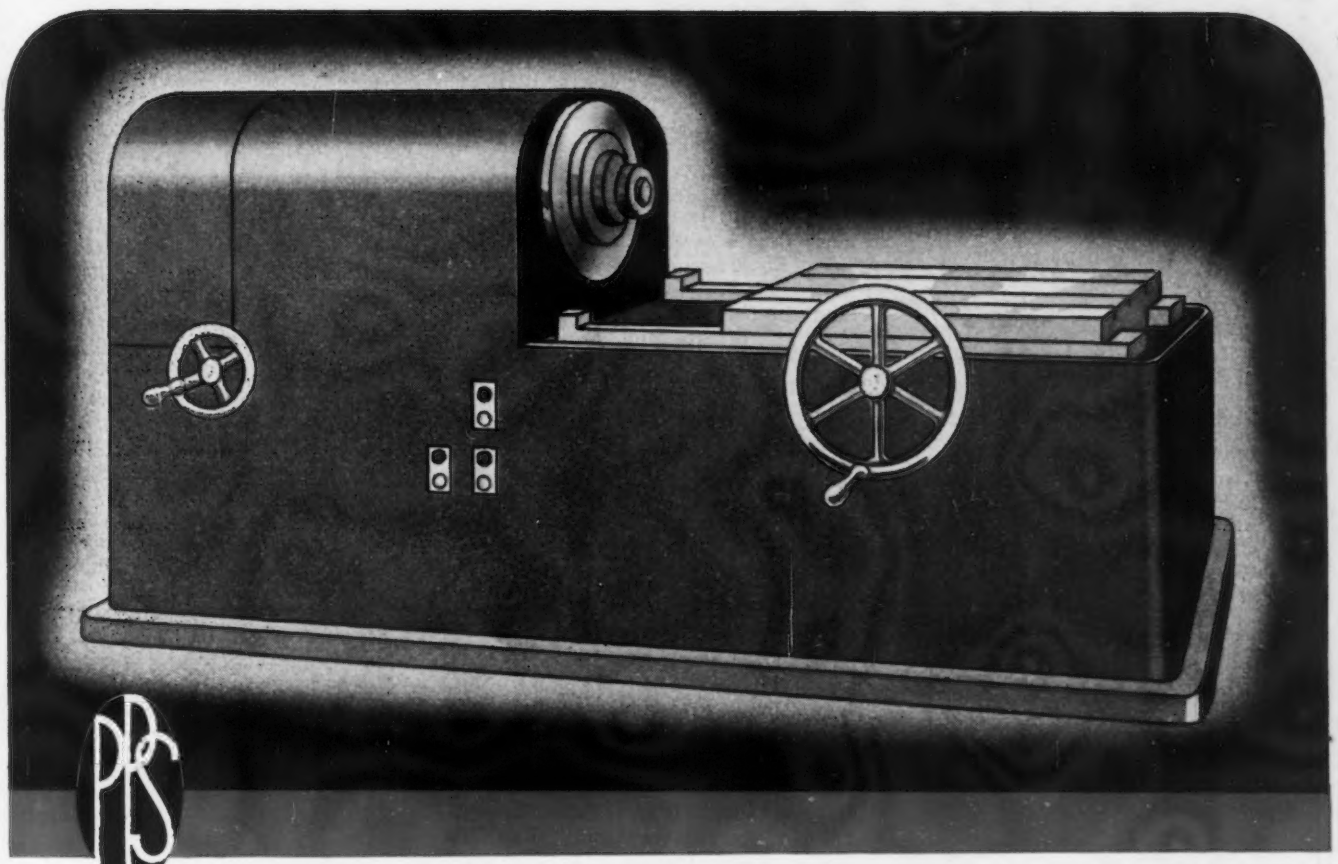
Puzzles

• • • Answer to last week's problem: 12 denarii to Caius and 18 to Sempronius.

Six minutes for this one gets you an A plus.

Of three men, A could purchase a watch if he used all his money plus one-half of the combined resources of B and C. B could purchase the watch using all his money plus one-third of A's and C's. C could buy the watch using all his money plus one-fourth of A's and B's.

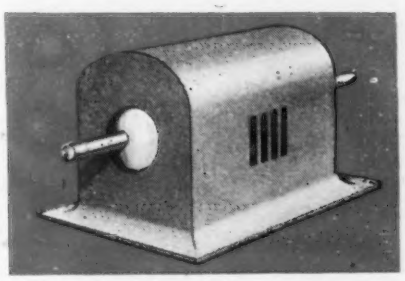
What is the cost of the watch? How much money have A, B, and C respectively?



PARTS FOR FACTORY EQUIPMENT & MACHINERY

Advances in engineering and design and improved materials will make "The work shop of the world" a new vision of utilitarian beauty.

Pressed Metal Parts and stampings will be used for factory equipment and machinery in the future, just as they have been in the past, but to an accelerated degree. They will make possible revolutionary advances, due to their ability to stand up to abuse, resistance to shock, rugged strength, ability to withstand corrosive conditions, survive radical temperature changes, not to mention low cost and a score of other characteristics, providing requirements not met by any other material.



Sound safe designs literally demand fullest possible use of stampings. Call on the Parish Pressed Steel Company for engineering cooperation. Our services will be found helpful.

★ METAL STAMPINGS ★ MODERN DESIGN AT LOW COST ★

PARISH PRESSED STEEL CO. *Subsidiary of* **SPICER MFG. CORP.**

READING, PA.

Western Representative: F. Somers Peterson, 57 California St., San Francisco, Cal.

Dear Editor:

NO RENEGOTIATION

Sir:

Your Dec. 9 News Front says, "Machine tool contracts entered into after June 30, 1943, will no longer be subject to renegotiation."

We have seen no such statement elsewhere. Will you be so good as to tell us the authority for the statement?

W. L. MILES

Miles Machinery Co.,
2025 E. Genesee Avenue,
Saginaw, Mich.

● Formal announcement of this exemption will probably be made when the new War Contracts Price Adjustment Board is officially established. The setting up of such a centralized board is favored by both the House and the Senate and just awaits passage of the entire bill.

Exemption of the machine tool industry for fiscal years after June 30, 1943, is one of the discretionary powers granted the board and we understand that such action will be taken.—Ed.

SPARK TESTING

Sir:

Have you any recent information concerning the spark testing of metals? We are particularly interested in getting illustrations which will show the sparks resulting from alloy and stainless steels, both SAE and NE series.

C. G. CHISHOLM,
Service Manager

Columbia Steel Co.,
Russ Bldg.,
San Francisco 6

● See page 38-42 in the Oct. 19, 1939 issue for information on spark testing SAE types. We know of nothing published on NE types, as they are still comparatively new.—Ed.

FORMING ALUMINUM ALLOYS

Sir:

I have been informed that you have published information on the cold forming of aluminum alloys. How can I obtain this?

B. FRANKLIN GRANT

4176 W. 24 Place,
Chicago

● Most of the information we have published has dealt with the forming of sheet stock in the aircraft industry through the use of either Kirksite dies or rubber dies. See editorial index for a complete list of the articles.—Ed.

CASTINGS

Sir:

What are the sources of high strength steel castings referred to in the Nov. 4 News Front page?

W. CORTLYN RHODES, JR.,
Production Manager

Air Associates, Inc.,
Teterboro, N. J.

● See "Castings in Aircraft Construction," page 52, Nov. 4 issue.—Ed.

OXYGEN LANCES

Sir:

I plan to spend a great deal of time in the research of the ultimate possibilities of the oxygen lance process. So far the information I have gathered has proved too superficial and limited. How can I obtain more detailed information on the actual operation and uses of this process in the steel industry?

WALTER PEARSON

Canal Dormitories,
Wine & Virginia,
Richmond, Cal.

● As far as we know, nothing has been published on this subject. We suggest you write directly to the two major concerns dealing with this equipment: Linde Air Products Co., 30 East 42nd St., New York, and Air Reduction Sales Corp., 60 East 42nd St., New York.—Ed.

THREAT TO THE MACHINE

Sir:

Four of a series of six graphic presentations published in IRON AGE some years ago have come into my possession. The four copies are: "He's Back in 1899," "Who Gets the Money," "More, More, More" and "Why Ten Million Unemployed." Have you a reprint of the complete series available?

G. R. CARPENTER,
Asst. Mgr., Work Simplifications

Federal Products Corp.,
1144 Eddy Street,
Providence 1, R. I.

● You refer to a presentation we made in 1939 entitled, "The Threat to the Machine." A few copies are still available, and one has been sent you.—Ed.

UNKNOWN PUBLISHER

Sir:

A recent issue of IRON AGE contained an advertisement for a book entitled, "Know Your Steels." The price was about $1.50. Can you tell me the name and address of the publisher?

J. A. OSBORNE

Westinghouse Electric & Mfg. Co.,
Dept. 4L13,
East Pittsburgh, Pa.

● We cannot locate the advertisement, and believe you have mistaken us for another publication. Can any reader supply us with the name of the publisher of "Know Your Steels?"—Ed.

STEEL DISTRIBUTION

Sir:

We are endeavoring to get statistical data on the distribution of steel for the years 1936 to 1940 inclusive, including the distribution through jobbers, dealers and distributors and by products and consuming industries. Have you any information on this?

THOMAS J. NEILAN,
President

Reliance Steel Products Co.,
2068 E. 37th Street,
Los Angeles 11

● See the Jan. 2, 1941 issue for an 18-year record of steel consumption by industrial groups, including jobbers, 1922 to 1939 inclusive.—Ed.

TOOL STEEL CORRECTIONS

Sir:

May we suggest some corrections for the next edition of THE IRON AGE Directory of Tool Steels? On page 23, our Diamond A has *chromium* 11.50 per cent, not tungsten.

On page 34, Five Star has vanadium 2.25 per cent in addition to the elements shown in your description of it.

You might add a molybdenum type high speed steel which we now make —"V-Star." This has chromium 4.00 per cent, tungsten 5.25 per cent, vanadium 1.50 per cent, molybdenum 4.00 per cent.

You might also add our #77 Alloy Tool Steel which has chromium 1.40 per cent and molybdenum 0.40 per cent. It is a molybdenum type steel used for taps and threading dies, lathe and grinding centers, plugs and ring gages, etc.

HENRY H. ZIESING,
General Sales Manager

Midvale Co.,
Philadelphia 40

TOOL STEEL DIRECTORY

Sir:

Some time ago we received your Directory of Tool Steels and have since been advised that you have issued a revised edition. Please let us know the price of six copies.

H. B. SMITH,
Secy.

McInnes Steel Co.,
Corry, Pa.

● Prices of the new edition are: Single copies, $1 each; five or more, 50c each.—Ed.

FREIGHT RATES

Sir:

We are preparing a freight rate schedule on steel products for our use in connection with our appraisal work and understand you have compiled rates on certain steel products from the basing points to a few of the consuming points. Can you supply us with this information?

JOS. T. SCHOENHOOR,
Research Dept.

American Appraisal Co.,
525 E. Michigan Street,
Milwaukee

● Changes have been so numerous that the freight rate schedule we published several years ago is worthless today. The American Iron and Steel Institute, Empire State Building, New York, may have the data you need. —Ed.

ROLLED BARS

Sir:

What rolling mills roll bars shaped like the letter U?

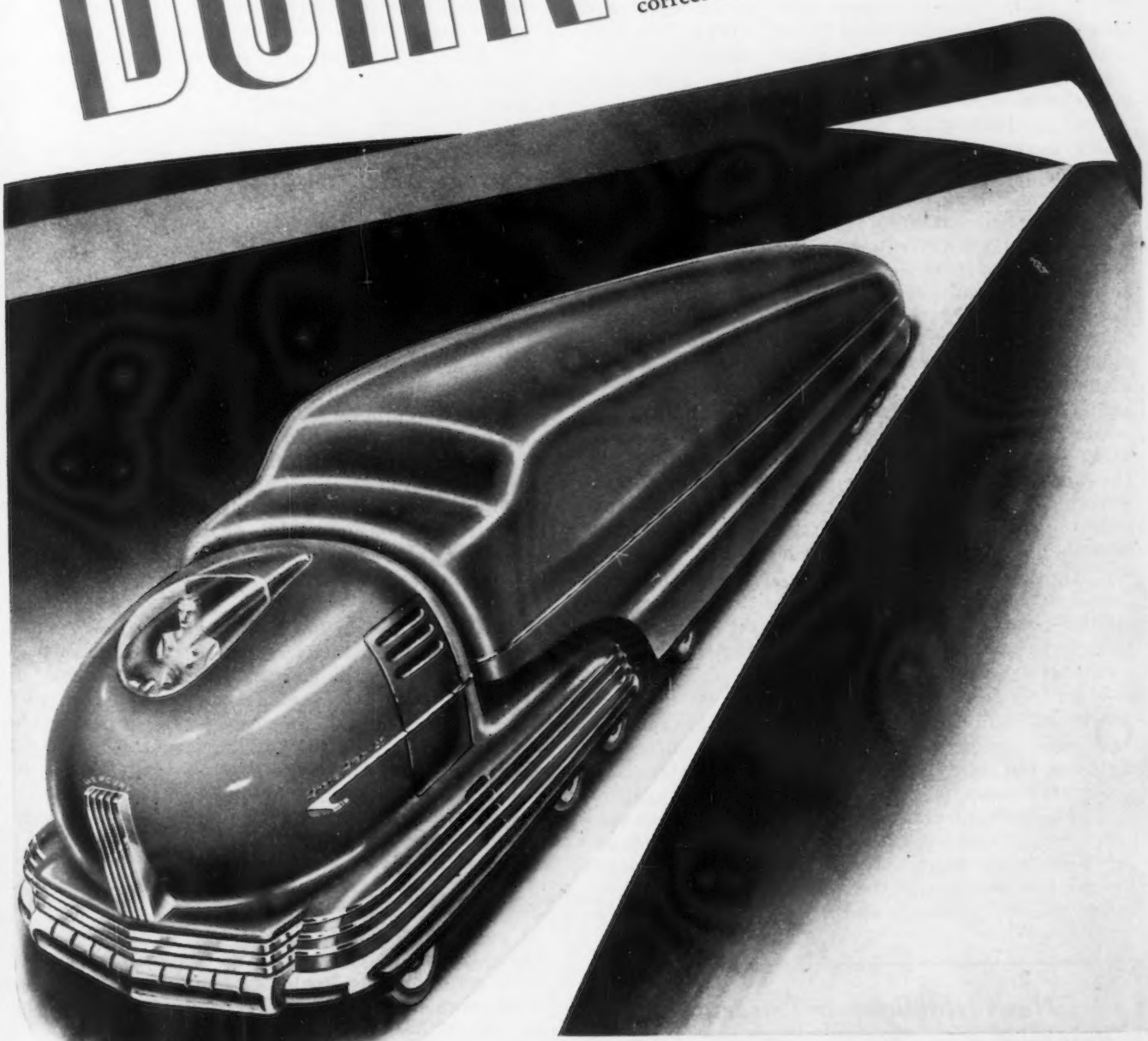
HARRY D. BIMSON,

318 N. 24th Street,
Richmond, Va.

● The shape you describe is evidently a channel, rolled as a standard shape by structural mills. Carnegie-Illinois Steel Co., Pittsburgh; Colorado Fuel & Iron Corp., Denver; Inland Steel Co., Chicago; National Steel Corp., Pittsburgh; and Jones & Laughlin Steel Corp., Pittsburgh, are among the companies having mills capable of rolling this section.—Ed.

BOHN

The engineers of the Bohn organization have made extensive studies in light alloys which will be of great importance in the development of tomorrow's new designs. Among other things, new types of highly efficient motor trucks will come forth. Bohn is the only organization in the world specializing in large volume, in three of the most essential alloys—aluminum, magnesium and brass. Thus this company is in a position to give unbiased advice. Consult us freely for the correct use of the correct light alloys.



TRUCKS TO COME

BUY WAR BONDS

BOHN ALUMINUM AND BRASS CORPORATION

GENERAL OFFICES—LAFAYETTE BUILDING, DETROIT, MICH.

Designers and Fabricators

ALUMINUM • MAGNESIUM • BRASS • AIRCRAFT-TYPE BEARINGS

This Industrial Week . . .

- **Sensational Year Ended, Industries Face Cutbacks**
- **Plan for Merging Claims Would Speed Termination**
- **Strike in Steel Industry Will Delay Invasion Equipment**
- **Earnings Outlook at Start of 1944 Poor for Steel**
- **National Ingot Output Slides Down to 79.5 Per Cent**

NEARING the completion of another sensational production year, metal producers and users in the United States find themselves facing distinctly cloudy conditions in early 1944. The first quarter will bring heavy contract cancellations by war agencies, and the mighty U. S. war goods machine, which surpassed all expectations for speedy output in 1943 while Nazi submarine warfare was being curbed simultaneously, is expected to have difficulty readjusting its production schedules.

For one thing, information has been inadequate concerning the extent of the proposed war agency cutbacks, which will run very high cumulatively by the end of the first quarter. Working in the dark, it will be difficult for industry to effect a smooth transition. A valuable aid would be a revolutionary plan which the Office of War Mobilization is considering closely for merging all of a war contractor's claims into one when contracts are cancelled, thus achieving great speed in termination. A high point of the plan, which has been compared to PRP, operating with money instead of preference ratings, is that all suppliers would be enabled to come to the government individually for their accounting. Many objections to the plan can be expected to arise from persons opposing short-cut methods.

High production levels obviously could be maintained in most industries through resumption of civilian goods output, but governmental officials have been forced to move slowly in this direction through a number of important considerations.

OF all industrial changes in 1943, perhaps the most striking is that of the steel industry, which at the start of this week was in the throes of one of its greatest strikes as the result of the expiration of union contracts. The steel industry, as of the early part of this week, faced 1944 with its earnings prospects very poor, particularly since President Roosevelt's promise to the steel union of a retroactive wage adjustment was accompanied by only a rather vague statement that some compensating aid might be given steel companies. The fact is that a retroactive price increase in the steel industry can only be made effective on unshipped tonnage.

Even before Philip Murray of the CIO asked for wage increases that will total close to $100,000,000 after taxes, the steel industry was well on its way to being forced to ask for price relief. The concentration of bookings on plates and hot rolled sheets, plus the cancellation of orders which carry a good base price plus extras, with increased costs, already had pulled earnings down. Now, it appears even heavier cancellations will be made by war agencies in first quarter.

Regardless of the outcome of the War Labor Board meeting Monday night at which time the unions petition was scheduled to be reviewed again it was apparent early this week that the expanding steel strike was endangering the United Nations' second front and invasion program. The companies which were hit by the strike were important makers of steel for invasion craft and components. An intricate directive program, set up by the WPB to insure delivery of the steel vital to the war, was being impaired seriously by the strike. Consumers hit by the strike were telegraphing "stop orders" to steel companies Monday, halting production on their orders.

THE reaction to the Roosevelt telegram overruling the WLB on its retroactive pay decision and calling on all steel men to avert a tieup was decidedly mixed. Some union leaders were aroused at the reference in the telegram to the orders which belong to the "hold the line" category. Steel executives were worried over whether relief for their companies could only be obtained through individual pleas. On all sides the lack of a clear-cut labor policy by the administration, which has resorted to patch work settlements, was being condemned.

This week's estimate of national steel ingot production is down to 79.5 per cent of capacity from 91 per cent last week. About 214 contracts held by the steel union expired at midnight Dec. 24, most of them with smaller steel fabricating firms but three with large steel producers. At mid-morning on Monday about 135,000 steel plant employees, of which 94,000 are basic steel workers, were on strike. A WLB directive appeared to be needed to prevent spreading of the strike.

Easier conditions in metals at the year end are reflected in several recent actions at Washington. Not only is there an excess of aluminum ingots but also of aluminum extruded shapes, according to WPB which is taking a census of capacity before ordering cutbacks. Another significant order is the

News Highlights in This Issue

lifting of Direction 2 to order M-21-a, an action which now affords alloy steel users the choice between open hearth and electric furnace grades, testifying to the passing of the carbon steel shortage. Still another important decision of WPB is the removal of pig iron from allocations effective Feb. 1.

Large stocks of important ferro-alloy materials as of Dec. 31, 1943, are revealed, indicating that the United States definitely is past the scarcity stage for many of these critical materials.

Relaxation of government limitation orders appears inevitable in 1944, but this does not necessarily mean substantial increases in the production of consumer goods in the immediate future. However, replacement of the nation's domestic transportation equipment, which is suffering badly through insufficient rolling equipment, is expected.

THE War Department announced on Monday that the production peak had been passed on several important phases of the military supply program but that 1944 deliveries would exceed those of 1943 in dollar volume. Next year's heaviest war production volume is reported to be concentrating on ships, planes, heavy construction machinery and signal materiel. The new turn in procurement is said to be caused by the Allies' shift from a defensive to an offensive type of warfare.

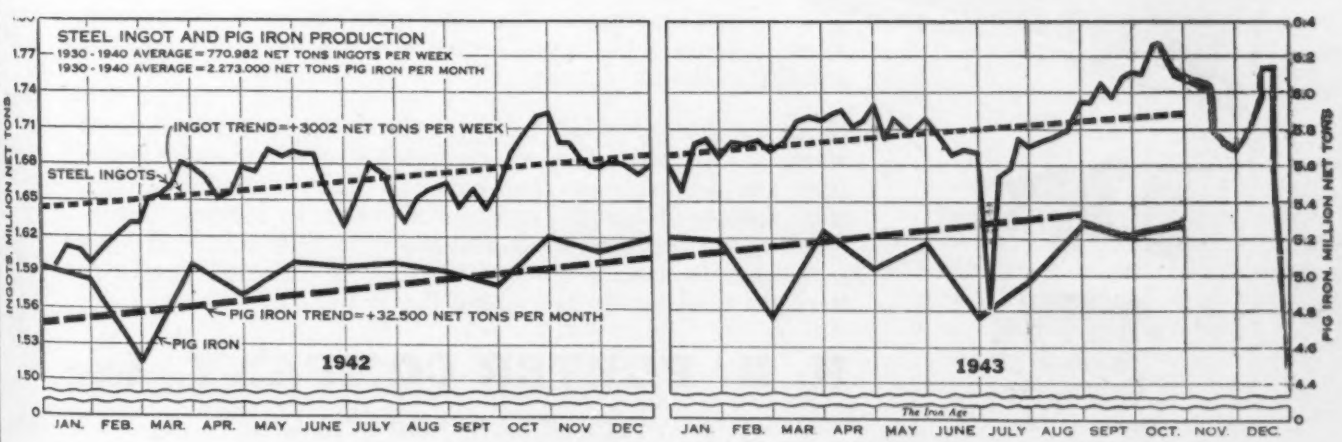
The department also reported that the Army construction peak had likewise been reached and that no new military construction would be undertaken next year in the United States when conversion of existing facilities will answer the purpose. Some camps are already being closed due to the orderly movement of troops overseas, the report said.

Major Gen. Lucius D. Clay said tank production had been reduced 36 per cent since early 1943; small arms ammunition programs were being tapered to a total decline of 36 per cent; artillery production was now off about 18 per cent; anti-aircraft about 50 per cent.

Machine tool shipments in November totaled $71,543,000, a decline of about eight and a half per cent from the $78,312,000 October total. The backlog of unfilled orders at the end of November was $245,571,000, a decrease of 14.3 per cent from October. The November backlog represented approximately seven and two-thirds months' accumulation at the November rate of new orders, or about four and a half months' production at the November rate of shipments.

IN connection with this week's drop in national steel ingot production to 79.5 per cent of capacity, the sharpest decline occurred in Detroit where ingot production fell 65 points to 36 per cent. All Great Lakes furnaces there were out. Down 51.5 points to 27.5 per cent were Youngstown operations. Wheeling output dropped 38 points to 57 per cent while Cleveland declined 25 points to 66 per cent. Pittsburgh was down half a point to 91 per cent and Chicago was down one and a half to 91.5 per cent. Increased half a point to 93 per cent was output in Philadelphia and Cincinnati was up nine points. A 10 point rise to 95 per cent occurred in the Eastern District.

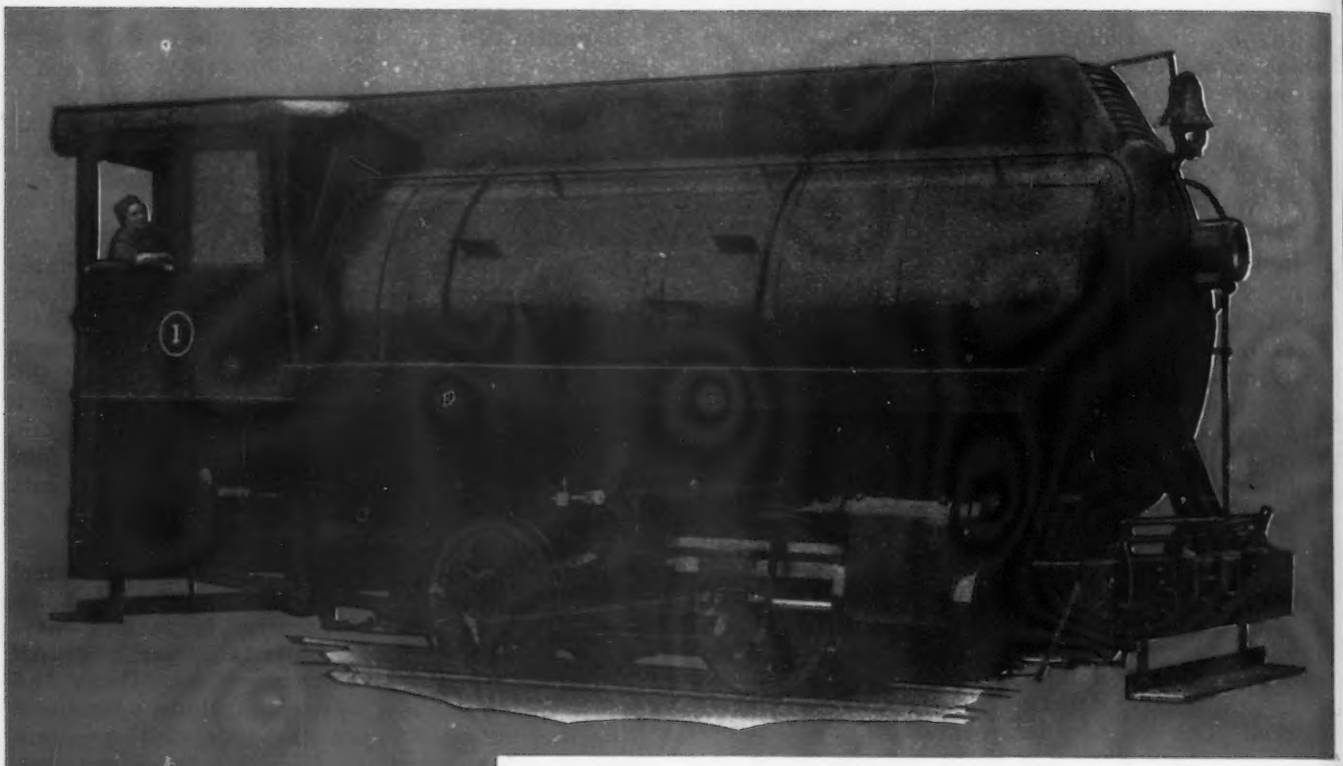
The Iron Age



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
December 23	91.5	93.0	79.0	92.5	91.0	99.5	95.0	99.0	101.0*	95.0	88.0	108.0	85.0	91.0
December 30	91.0	91.5	27.5	93.0	66.0	84.0	57.0	99.0	36.0	95.0	97.0	108.0	95.0	79.5

* Revised



Even the Gals can run a PORTER FIRELESS!

It's no trick at all to operate a Porter Fireless Locomotive. Put an untrained woman war-worker at the throttle and she'll be switching 'em like a veteran in no time at all.

That's really something in these days of manpower shortage, but that isn't all: Porter Fireless Locomotives cost less to buy, less to operate and less to maintain. They last longer—the first Porter Fireless is still operating after 29 years of service. There are no fumes or dirt, and a soft exhaust is the only noise.

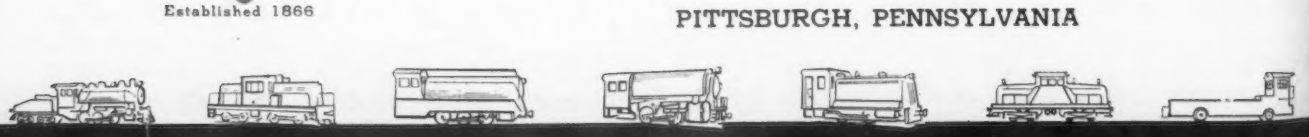
Since the Porter Fireless has no firebox, there is no fire hazard—steam is charged into the locomotive's reservoir at 85 pounds, from any available source about the plant. A boiler explosion is impossible. Charging can be done in about 30 minutes during an idle period and no week-end attention is required. If you are interested in saving up to 50% in your haulage costs, write for illustrated folder describing the Porter Fireless.

ARMY E NAVY

PORTER "Better Built" Locomotives
Established 1866

H. K. PORTER COMPANY, Inc.

PITTSBURGH, PENNSYLVANIA



ONLY **PORTER** BUILDS A *COMPLETE* LINE OF LOCOMOTIVES FOR INDUSTRY

Prompt Cancellation Settlements Promised by Revolutionary OWM Plan

Washington

• • • **A revolutionary plan** for getting war contractors paid promptly in contract cancellation settlements is reported to be coming out of the Office of War Mobilization soon.

Going farther than the War Department suggestion that contracts be terminated on a plant basis with the procurement agency which has the preponderance of the contracts being responsible for effecting settlements, the new plan would sweep aside existing contracts and merge all of a contractor's claims into one.

It is claimed that under this method of settlement the Government can terminate 90 per cent of all the contracts in effect and account for as much as 85 per cent of all money owed to contractors by the Government, through dealing with only 2000 plants of no more than 1650 contractors.

This administrative advantage will give the Government the speed in payment it has been seeking. It is obvious that it will be better to deal with 1650 contractors to get so much of termination out of the way speedily, than separately canceling the 250,000 contracts held by the war manufacturers.

The high point in the plan, which has been compared to PRP operating with money instead of preference ratings, will enable all suppliers and subcontractors to come to the Government individually for their end-of-the-war accounting.

Objections are expected from lawyers and accountants that the Government will be disturbing rights that have been vested in a manner which would be unconstitutional, that is in the impairment of hundreds of thousands of contracts. Another main objection will be, it is feared, that it is illegal to make subcontractors responsible to anyone else than their prime contractors.

A new agency would have to be created to handle the applications for settlement of prime contractors. This is deplored by some Government officials because it is politically unwise at this time to create new agencies when bureaucracy's unpopularity is at its height. But this will not deter OWM.

A revamperd Smaller War Plants Corp. is expected to handle the numerically huge number of claims of suppliers and subcontractors. The number of claimants will run into the millions, it is pointed out, but dollarwise the total of all of these claims is expected to be only 15 per cent of all the money the Government will owe.

It is expected that the forthcoming report by Bernard M. Baruch covering the reconversion of industry will emphasize the need for starting the job immediately, so that urgent problems which show every sign of arising long before the war ends, can be tackled immediately. Mr. Baruch will advocate that industries be given every possible encouragement.

o o o

Amortization Authority Granted WPB; Application Instructions Outlined

• • • **The President has** signed an Executive Order transferring the certifying authority for tax amortization privileges from the Secretaries of War and Navy to the Chairman of the War Production Board. Chairman Donald M. Nelson said that with few exceptions the United States now has the capital equipment needed for completion of the war production program. **"The effort today,** therefore, is directed, not to further expansion of plant, but to full utilization of existing capacity," Mr. Nelson said.

In connection with the administration of the certifying authority the following points are of special interest:

1. Taxpayers who wish to avail themselves of tax amortization privileges must hereafter file applications for necessity certificates from the WPB.
2. Effective Dec. 17, 1943, where new facilities have not yet been acquired or construction is not yet begun, the application for a necessity certificate must thereafter be filed along with the application for specific authorization or for priority assistance. Issuance of necessity certificates will not be considered unless these applications are filed together.
3. In such cases—where construction has not begun or facilities have not been acquired—applications for necessity certificates and applications for priority assistance should be filed with the agency with which the priority application itself would normally be filed.
4. In cases where construction was begun or facilities were acquired prior to Oct. 5, 1943, applications for necessity certificates should be filed only with the War Production Board.
5. The Facilities Bureau of the WPB, under the supervision of vice-chairman Donald D. Davis, will handle the analysis of applications for tax amortization privileges. Roy W. Johnson, director of the Facilities Bureau, has appointed Carman G. Blough as deputy director of the Facilities Bureau for Tax Amortization, with authority to approve necessity certificates for WPB.

Tax amortization privileges were written into the law in 1940, shortly after the start of the rearmament program, in order to encourage expansion of privately owned facilities of the national defense program. This was accomplished by insertion in the Internal Revenue Code of a new section—Section 124. The law as thus amended allowed taxpayers to write off the cost of facilities over a five-year period (or less should the emergency end sooner) instead of over the longer depreciation period normally used, in cases where the facilities were certified to be necessary in the interest of national defense.

Military Production Concentrating On Few Lines; Dollar Volume to Climb

Washington

• • • **The War Department** announced on Monday that the production peak had been passed on several important phases of the military supply program but that 1944 deliveries would exceed those of 1943 in dollar volume. Next year's heaviest volume is reported to be concentrating on ships, planes, heavy construction machinery and signal materiel. The new turn in procurement is said to be caused by the Allies' shift from a defensive to an offensive type of warfare.

The department also reported that the Army construction peak had likewise been reached and that no new military construction would be undertaken next year in the United States where conversion of existing facilities would answer the purpose. Some camps are already being closed due to the orderly movement of troops overseas, the report said.

Major Gen. Lucius D. Clay, director of materiel, Army Service Forces, reported that heavy truck production was steadily increasing. He also said that dollar volume of military production scheduled for next year would exceed the 1943 volume by 75 per cent; Signal Corps equipment expanded 80 per cent from January to November of this year and was scheduled for further increases; heavy construction equipment and landing mat demands would reach an all-time high in 1944.

Concerning cutbacks, Major Gen. Clay said tank production had been reduced 36 per cent since early 1943; small arms ammunition programs were being tapered to a total decline of 36 per cent; artillery production was now off about 18 per cent; anti-aircraft about 50 per cent; medical and surgical supplies about 50 per cent, and TNT lines are being converted on a wide scale to other production.

Demands for heavy construction equipment and steel landing mats will reach new highs in 1944 to meet requirements for new bases and bridgeheads as conquest of enemy territory moves forward.

General Clay said that production of 90-millimeter anti-aircraft guns had been cut to one-twelfth of the maximum and production of 4.7-in. and 40-mm. guns to one-half the maximum. The production of 90-mm. guns has been discontinued at three Government arsenals and 12 private manufacturing companies and cut back at 16 other companies. Production of 4.7-in. AA guns has been eliminated at two arsenals and cut back at four companies and production of 40-mm. guns eliminated at 13 companies and cut back at nine.

"Most, if not all, of these plants referred to above have been shifted to the production of other war materials," General Clay stated.

o o o

Uncertainty Noted in Markets For Iron and Steel in Dominion

Toronto

• • • **In the** Canadian steel markets, business is showing a rather indifferent trend. The uncertainty that has developed with regard to the future of war production, with the year-end holidays, has brought new order placing virtually to a standstill. War consumers have become wary in placing orders for forward delivery and in most instances the tendency is to underbuy. Another important factor is that many are carrying large inventories, and are endeavoring to reduce them. In addition to earlier reports regarding curtailment in war production activities, announcement was made this week that Defence Industries, Ltd., Montreal, is closing down and will let out some 3,000 workers over the next several weeks.

During the past month or six weeks there has been definite easing in supply of iron and steel for Canadian consumption. While some mills are fully booked on production for the coming quarter, others are seeking contracts and report substantial surplus capacity still to be filled. While over-supply is chiefly in heavy plate, structural shapes and some other heavy lines, there is no shortage of bars, carbon or alloy. Sheets are still under brisk market demand with no surplus stocks available for the coming three months, insofar as producers are concerned, but warehouse stocks have been improving recently.

Steel producers are looking to civilian manufacturing enterprise to absorb any slack in demand on war account, and it is apparent that these consumers are prepared to enter the market in a big way. However, there are still restrictions to be overcome before any large swing into civilian production can be entered into. While the heavier steel materials have been dropped from control regulations and are available to any purchaser, Wartime Prices and Trade Board officials have not come through with releases for the production of civilian goods with the result that while civilian users can order steel and other materials they are unable to proceed with production schedules until the Trade Board grants permission. Already plans have completed for civilian production on a fairly extensive scale in the early part of the New Year, including washing machines, refrigerators, radios, agricultural implements, and a number of other items and it is hoped permits will be granted without further delay.

According to recent announcements regarding new plants, there should be favorable upturn in demand for structural shapes during first quarter. Several large structures are to be built, ranging in value up to $1,500,000. Some of these projects were planned as far back as two years ago, but were held in abeyance as a result of restrictions on use of steel and other materials when war demand was at its peak.

WPB Eases Order On Aluminum Scrap

Washington

• • • **WPB last Thursday** issued Amendment 1 to Order M-1-d, as amended, relating to aluminum scrap. The amendment removes from the definition of aluminum scrap residues containing less than 50 per cent recoverable aluminum. This change was made to screen out the too large percentage of low grade materials being brought in.

In addition, the order relaxes the requirement that persons generating or holding aluminum scrap deliver such scrap at 60-day intervals. The amendment provides that the scrap be delivered at reasonable intervals.

Wage Demands Reveal Steel Firms Have Been Drifting Close to Brink

By TOM CAMPBELL
Pittsburgh Regional Editor

Pittsburgh

• • • **The steel union** does not know it, some steel executives are not yet aware of it, the OPA suspects it, but the steel industry or part of it may soon go into the red on its net earnings, wage increases or no.

Governmental cutbacks on items that had been "carrying the load" are responsible for the paradox of the steel industry reaching the point where, after taxes, some stockholders may whistle for their returns. Despite record breaking output, many steel companies are concentrating (under WPB control), on plates and hot rolled sheets which, in a good market, are only chicken feed when it comes to adding up the tally sheet.

Thus, the reluctant steel industry, before Phil Murray asked for wage increases that will total close to four hundred million dollars (one hundred million after taxes) was well on the way to being forced to ask the OPA for price relief. Private sources estimate that increased costs, due to raw materials, etc., had run up to nine dollars a ton. Murray's demands (which will not be met in whole either by the steel companies or the WLB) would add up to nearly five dollars a ton.

Reluctant to disclose costs sheets to OPA, the steel industry had waited too long to get in its plea for a price rise to take care of increased costs before Murray came out with his demands. Many companies are or have already approached the OPA on the question of price relief, not only on the basis of a possible wage increase, but on the standing that costs have already reached the point where something must be done.

However, the method or road to an increased price structure is far more complicated than the desire. Heretofore, there have been two roads: a product route and an over-all company increase. Both would have meant today a company price differential either in products or a product. Both are out, practically, speaking, because no steel company today, which would charge more than another, would get any tonnage, since others are able to produce the item and will sell it at ceiling price until they get relief. Thus, the OPA is faced with a new problem—how to take care of the steel industry as a whole and not on a company basis.

To further complicate the matter, if the steel industry seems destined to get some kind of relief then Phil Murray can be assured of getting some part of his demands. This looks good on paper, but on the other hand leaves steel competitors (aluminum, brass, plastics, etc.) shouting with glee, just as gas, oil, etc., felt when a rise in coal prices took place.

Some astute labor observers are asking why the steel union and the steel companies have placed themselves in the same position as the coal industry. There is a ghost of a chance, it is said, for the steel union, to come clean with the steel industry and make a bargain that will not have to have the sanction of the WLB.

None the less, the steel industry will soon look to OPA for a price relief, not only to take care of a possible wage increase, but to take care of increases already encountered. There will obviously be a clause to take care of any raise that might be granted. However, a retroactive wage increase will leave the steel industry "holding the bag" because a retroactive price increase is one of those "on paper" things that, due to steel practices, can only be made effective on unshipped tonnage.

The reasons for increased steel cost guarantee are not hard to find. Many steel companies have had cutbacks on important government work. War contracts brought fairly good base prices as well as processing extras. A lot of this has gone out of the window. The load on the less profitable items, such as plates, hot rolled sheets and hot rolled bars, is still heavy, but is without the support of some of the more profitable items. Furthermore, the unusual and extended capacity operations have produced their share of the profit picture.

o o o

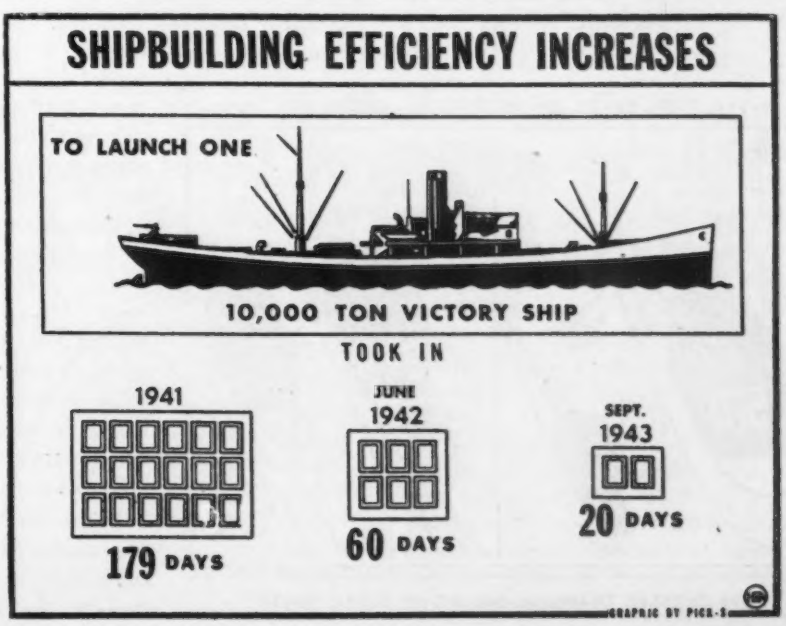
Union Petition Denied; Industry-Wide Bargaining Aim Is Disclosed

By DONALD BROWNE
Washington Staff

Washington

• • • **The War Labor Board** denied the CIO-USW petition for retroactive application of union demands on Dec. 23. A compromise proposal offered by the public members also was rejected. Highlighting the hearing, Dec. 21, on union demands was its insistence on industry-wide collective bargaining.

The CIO petition asked the board to issue an order compelling the steel industry to extend existing agreements which the union had terminated with a retroactive provision that whenever WLB granted a wage increase the pay raise would be related back to Jan. 3, 1944, the date most



contracts expire. The petition was defeated by an 8-4 vote with the public and industry members constituting the majority.

It should be pointed out, however, that the defeat of the CIO petition does not mean that WLB will not order retroactive features in future cases involving the steel industry before it. Nor does it mean that the board will not give the USW a substantial part of the $1.36 a day increased pay it has demanded.

The public members of the board said that they voted with the industry members on the CIO petition because the labor members had joined with the industry members in defeating the public members' compromise proposal.

The industry members said they voted to defeat the retroactive feature because they thought that the union has no right to an increase and that approval of the retroactive provision would give the public a false impression that WLB was going to grant the steelworkers a wage boost.

The public members' compromise was also defeated by a vote of 8-4 when the labor members joined the industry members. The compromise provided as follows with respect to retroactivity:

"If a wage adjustment is ordered by the board, the board will make the adjustment effective as of the date that the agreement would have expired under the termination provision in the contract unless the parties otherwise agree, provided the board may establish other effective dates on any other issues affecting wages which are of such a nature that it is not practicable to make retroactive provision. Nothing in this paragraph shall be construed as an order effecting one way or another any question not within the standards set forth in the stabilization act of October, 1942."

The reason labor members voted against the compromise is that the stabilization act and the executive orders issued pursuant thereto would generally prohibit a general wage increase. Furthermore, the "out" which the compromise would have given the board with respect to "any other issues affecting wages which are of such a nature that it is not practicable to make retroactive provision" did not suit the labor members either.

In the hearing Dec. 21, in which the board heard both steel operators and the union arguments, it was apparent that a national strike threat is implicit in the steel union's demands, although CIO's General Counsel Lee Pressman attempted to impress the board that USW prefers to keep its "no strike" pledge.

Although he denied it, it was apparent from the attitude of WLB Chairman William H. Davis that the union's reliance on the government's giving in to the bituminous coal miners with a consequent price rise in coal is the pattern to be followed by the board in steel.

Mr. Davis said it would be possible to insert a clause in any new wage contract providing for an increase in wages if the companies are permitted to increase steel prices following the bituminous coal agreement. However, he said that any wage increase would have to be approved by Economic Stabilizer Vinson and price increases by Price Administrator Chester Bowles.

The entire board seemed to listen sympathetically to operators' statements that new general wage increases in the industry must be followed by general price increases if the industry is to survive. One non-integrated company pointed out that it was losing $8 a ton on its plates because of the prices it was being forced to pay for slabs.

Another company said that its November profit would be less than 1/10 of 1 per cent. Still another steel operator said that his company would be forced to close down a government-financed battery of coke ovens because OPA would not listen to its requests for a price increase.

However, the companies called the board's attention to the fact that practically all of their contracts are fixed price contracts and that they cannot make retroactive adjustments in steel prices to cover any increased labor cost which would result from wage increases to the steel workers.

Although steel operators did not argue against industry-wide collective bargaining when this issue was injected into the debate on retroactive pay by CIO's General Counsel Lee Pressman, observers say that the companies are more opposed to this union demand than any other.

"The only way the union could get this additional power would be for the government to order it," is the way one steel executive put it.

The effect would be to constitute the USW as the board of directors for the entire steel industry. Lest there be any doubt of CIO's motive in trying to get the government to force the steel industry to bargain on an industry-wide basis, the following quotation from the book "The Dynamics of Industrial Democracy" erases that doubt. The authors of the book are Clinton S. Golden and Harold J. Ruttenberg. The book, which was published by Harpers in 1942, says:

"Hence organized labor seeks industry-wide bargaining as a means of raising the real earnings of its members on a relatively permanent basis. In the question of a higher plane of living, organized workers have begun to sense a certain frustration because their hourly increases in wages afford them only temporary gains. Consequently, the major problems facing industry-wide collective bargaining conferences when they are inaugurated in the newly unionized industries will be to determine:

"1. What share of the industry's income should go to wage earners? To owners? To consumers?

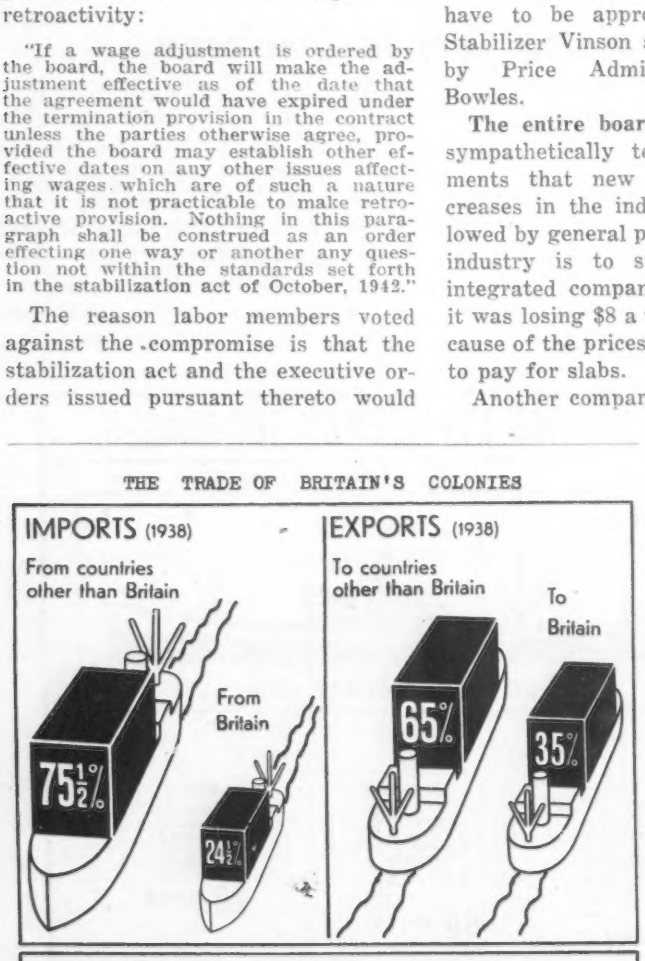
"2. How shall the respective shares be distributed so that they will stay so distributed?"

Somewhat less clear is the Administration's endorsement of this philosophy. But both Golden and Ruttenberg occupy high government posts. Golden, who is assistant to CIO President Philip Murray, is the government's No. 1 manpower adviser. He is manpower vice-chairman for both WPB and the WMC. Ruttenberg, CIO's research director, is assistant director of the WPB Steel Division.

Industry-wide bargaining strikes at geographic pay differentials, and other individual argeements between the union and the companies, and even at labor laws of the various states.

CIO has not completely organized the steel industry, nor are the closed shop and the check-off universal, but if the union gets the right to bargain on a nation-wide basis, the unions would be able to control hiring policies.

THE TRADE OF BRITAIN'S COLONIES



The British Colonies depend on world trade

Steel Suffering Worst Strike Since '37; 135,000 Workers Out, Absenteeism High

• • • **The steel industry,** early this week, was in the throes of one of its worst strikes since 1937, as a result of union contracts expiring without the War Labor Board agreeing to the union's demand that the board order an extension with a retroactive clause where steel companies refused to do so. The strike spread in Ohio at midnight Dec. 24, when the Youngstown plants of Republic Steel Corp. and Youngstown Sheet & Tube Co. were shut down. The full force of the blow, however, was felt at midnight Sunday and early Monday of this week, when additional employees failed to turn up.

About 214 contracts expired at midnight Dec. 24. Except for four large steel companies, most of these agreements covered smaller steel fabricating units who, nevertheless, were all working on strategic war work.

Up to late Monday of this week, more than 135,000 steel workers and steel fabricating workers were idle. Close to 94,000 of this total included workers at specific basic iron and steel plants. It was reported that absenteeism at some of the plants which were not struck was much higher than usual, although this may have been due to holiday effects.

Late Monday afternoon, the WLB announced a special meeting would be held that evening, to again go over the steel labor petition calling for an extension of contract with a retroactive date. Chairman Davis of the WLB, in announcing the meeting, said that "he would consider it highly rational for the labor and industry members of the board to reconsider their position and vote to extend contracts of the union with the provisos stated by Mr. Roosevelt." It was believed that after the meeting some arrangements would probably be made which would be satisfactory to Murray, who previously had been silent on President Roosevelt's intervention statement.

Early this week, the Ohio and Chicago plants of Republic were down, as well as Youngstown Sheet & Tube Co. plants in those areas. Wheeling Steel Corp. plants in West Virginia and Portsmouth, Ohio, were down, and a strike also closed Great Lakes Steel at Ecorse, Mich.

Republic Steel, early this week, was still operating plants at Buffalo, and at Gadson and Birmingham, Ala. In its manufacturing divisions, eight plants were in operation and 11 were idle.

The most serious aspect of the strike, which was unfolding at midweek, was the substantial number of the smaller plants, all of which were on important war work, the cessation of which is expected to seriously interfere with the invasion program. Furthermore, all of the large steel companies which had been struck were important makers of steel plates and other flat rolled items urgently needed for the invasion craft program which is being expedited by the Navy. Other steel companies, whose operations were still intact, were unable to take on any of this load, since they were operating at top capacity themselves.

It was apparent at steel centers like Pittsburgh, Chicago and Cleveland that the United Steel Workers of America had adopted the same pattern as the coal strike—"no contract —no work." As late as Monday afternoon, no official statement had been forthcoming from Philip Murray, CIO head and President of the steel workers' union, who has, at various times, reiterated his "no strike" pledge.

Republic Steel Corp., as well as Youngstown Steel & Tube, have expressed to the War Labor Board a protest against picket lines, and have contended that the union has violated the "no strike" pledge.

Regardless of the outcome of the current strikes, and even though something may turn up to prevent a complete spread when a series of contracts run out on Jan. 3, it is expected that already the WPB's intricate steel directive program has been ruined. In addition to making flat rolled products, Republic Youngstown Sheet & Tube, and Wheeling are heavy producers of other urgently needed steel items.

Reaction to President Roosevelt's telegram was mixed in some of the steel centers. Some union leaders were said to be in an uproar over the paragraph where reference was made to the various executive orders, etc., which belong in the so-called "hold the line" strategy against inflation. This part of the President's statement said, in agreeing to a retroactive feature, "If any wage adjustments are made, they must of course be made in accordance with the Act of Congress Oct. 2, 1942, Executive Orders 9250 and 9328, and the Policy Directive of May 12, 1943."

The possibility that steel companies might receive some aid in case a retroactive adjustment would result, was rather vague. There was no guarantee for the steel companies, and the actual statement said, "The question of undue hardship to individual employers resulting from the agreement, to make such adjustments retroactive . . . will be given due considration by the agencies of government concerned with costs and prices." It is not known whether the works "undue hardship" and the words "individual employers" were given with the idea that individual steel companies would have to take up their problems one by one. Certainly, there appeared to be no assurance that the government agencies would necessarily rule in favor of relief.

o o o

Weirton Offers to Meet Wage Demands If Higher Prices, Approval Are Granted

Weirton, W. Va.

• • • **In a formal reply** to demands of the Weirton Independent Union Inc., for a wage increase, Thomas E. Millsop, president of the Weirton Steel Co., last week told the union by letter that the company would be willing to grant any wage increase authorized by the National War Labor Board and covered by a corresponding increase in steel prices authorized by the Office of Price Administration and the Department of Internal Revenue.

Mr. Millsop pointed out that the authority to change wage rates was not in the hands of the Weirton Steel Co. but rested with the National War Labor Board. He emphasized, however, that no wage increase could be paid by the Weirton Steel Co. unless accompanied by an increase in steel prices.

"We will gladly make such increase in wages as will be justified by a corresponding increase in steel prices authorized by the War Labor Board, the Department of Internal Revenue and the Office of Price Administration, respectively," Mr. Millsop said.

Roosevelt Approves Retroactive Union Clause in Surprise Action

• • • **In a surprise move** to head off the general steel strike, the President sent identical telegrams Sunday to Philip Murray, president of the CIO; to Republic Steel, Youngstown Sheet & Tube Co. and to G. H. Hanks, president of Taylor Wharton Iron & Steel Co. at Highbridge, N. J., urging them to keep steel flowing.

The President specifically stated that final arrangements should be "computed and applies retroactively to the date when the particular contract in question would have expired."

This stand by the President for retroactivity of any steel wage adjustment followed the recent vote of the War Labor Board against making the steel-wage adjustment retroactive, which Mr. Murray called a "provocative" act, although William H. Davis, WLB chairman, indicated over the week-end that the way was open for the board to reconsider its vote.

The President's telegrams said in part:

"The disputes between the companies and the steel workers must be settled under the national no-strike agreement by the peaceful means set forth.

"I therefore request the companies and the steel workers to continue the uninterrupted production of steel and steel products under the terms and conditions of their old contracts until the differences that now separate them are peacefully and finally resolved, with the understanding that if the new agreements include any wage adjustments, such adjustments shall be computed and applied retroactively to the date when the particular contract in question would have expired by virtue of the notice of termination under such contract.

"If any wage adjustments are made they must of course be made in accordance with the Act of Congress of Oct. 2, 1942, and Executive Orders Numbers 9,250 and 9,328, and the Policy Directive of May 12, 1943, issued pursuant thereto.

"It would be unfair to the steel workers and to the companies unduly to prolong this period of uncertainty, and I am therefore asking everyone concerned to proceed with all speed consistent with the complete and fair-minded settlement of the dispute. If it is referred to agencies of the Government, I shall make the same request of those in charge of such agencies.

"If there is a wage adjustment within the standards set forth in the Act of Oct. 2, 1942, and Executive Orders Nos. 9250 and 9328, and the Policy Directive of May 12, 1943, issued pursuant thereto, the question of undue hardship to individual employers resulting from the agreement to make such adjustments retroactive to the expiration date of the particular contract in question will be given due consideration by the agencies of Government concerned with costs and prices."

The steel labor problem was only one of several important controversies facing the Administration. A threatened railroad strike Dec. 31 was one of these other problems. The President issued an ultimatum calling for arbitration and the rail unions were expected to reply early this week.

•

Two-Day Strike by Foremen Impairs Willow Run Output

Detroit

• • • **A two-day strike** of foremen at the Willow Run plant of Ford Motor Co. began to impair production before ending of the walkout Dec. 22 on unspecified terms.

The strike, called by the Foremen's Association of America, an independent union, occurred after one of the members was docked 44 hr. pay for taking that time to do grievance work. The company stand was that there were no bargaining provisions permitting foremen to do grievance work on company time.

More than 1500 of 2000 foremen on two shifts participated in the walkout. Production was unimpaired during the first day, but began to be badly affected on the second day before the supervisors were ordered back by their union to their jobs.

Who's Who In Steel Strike

• • • **This preliminary check of steel strikers early Monday showed the following numbers out from these companies:**

Republic Steel, Youngstown—30,000; Republic and Timken Roller Bearing, Canton, Massilon, Ohio—20,000; Republic, Cleveland—7000; Timken, Columbus, Ohio—2000; Valley Mould & Iron Co., Hubbard, Ohio—600; Wheeling Steel at Wheeling, Beech Bottom, Benwood, W. Va., and Steubenville, Portsmouth, Martins Ferry and Yorkville, Ohio—20,000; Blaw Knox at Columbus, Martins Ferry Ohio, and Pittsburgh—7000; Elliott Co., Jeannette, Ridgeway, Pa., and Springfield, Ohio—1000; Crucible Steel, Midland, Pa.—6500; Babcock & Wilcox Beaver Falls, Pa.—3500; American Chain & Cable Co. Page Steel & Wire Div. Monessen Pa.—1100; Pittsburgh Screw & Bolt, Pittsburgh—1100; Heppenstall Co., Pittsburgh—800; Shenango Penn-Mold Co., Sharpsville, Pa.—750; Apollo Steel Co., Apollo, Pa.—700; McConway & Torley Corp., Pittsburgh—550; Canonsburg Steel & Iron Works, Canonsburg, Pa.—430; Columbia Steel & Shafting Co., Carnegie, Pa.—400; Walworth Co., Greensburg Pa.—200; Youngstown Sheet & Tube Co., Indiana Harbor, Ind.—6700; Youngstown Sheet & Tube, South Chicago, Ind.—1200; Great Lakes Steel Corp., Ecorse, Mich.—2000; Republic Steel Corp., Troy, N. Y.—200.

Grand total of workers idle is 113,730 at this count.

Roemer Resigns Pittsburgh Steel Post

Pittsburgh

• • • **Henry A. Roemer** has resigned as chairman of the board and director of the Pittsburgh Steel Co.

In his letter of resignation to the board of directors, Mr. Roemer stated that plans for the consolidation of the interests of the Pittsburgh Steel Co. and the Sharon Steel Corp. of which he is chairman and president, were abandoned some time ago and that war production and post-war problems of Sharon Steel and its related companies, the Niles Rolling Mill Co. and Mullins Mfg. Corp., of which he is chairman of the board, will require his full attention.

The executive committee announced that Mr. Roemer's resignation is being accepted with regret.

PIG IRON PRODUCTION *in November totaled* 5,038,605 *net tons compared with* 5,257,988 *tons made in October. Ferromanganese and spiegeleisen for November amounted to* 57,494 *tons, while* 65,750 *tons were produced the previous month.*

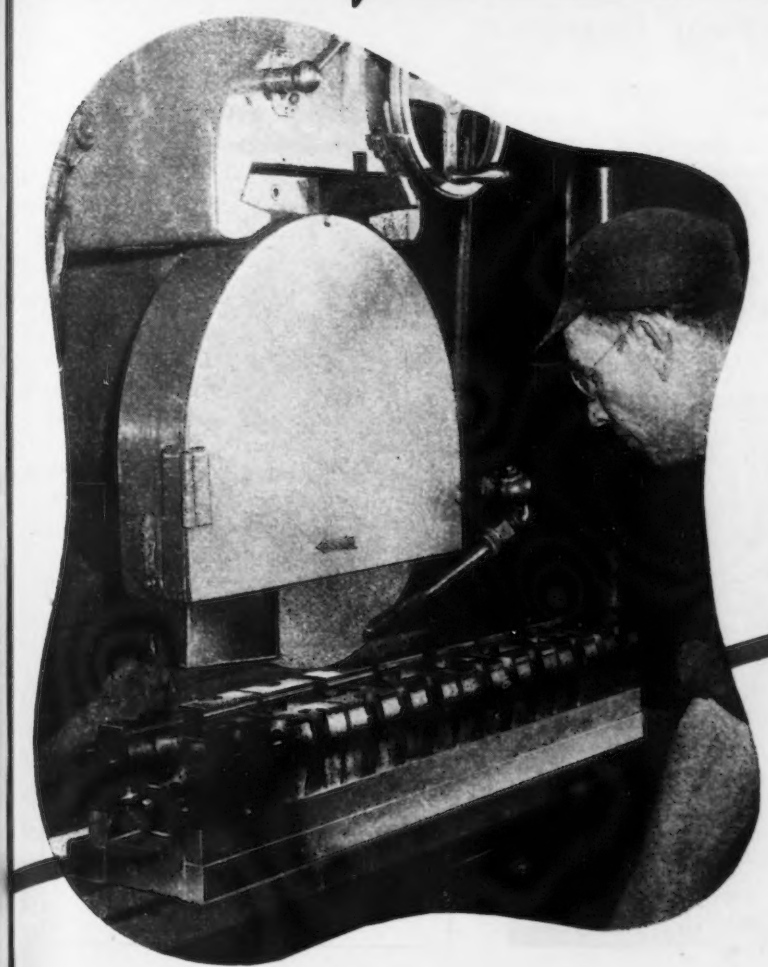
NOVEMBER BLAST FURNACE PRODUCTION—NET TONS

Source: American Iron and Steel Institute

	PIGI RON		FERRO-MANGANESE AND SPIEGEL		TOTAL		
	Current Month	Year to Date	Current Month	Year to Date	Current Month	Year to Date	November Percent of Capacity
DISTRIBUTION BY DISTRICTS:							
Eastern	951,751	10,495,667	18,389	213,285	970,140	10,708,952	91.6
Pittsburgh-Youngstown	2,079,886	23,094,019	19,448	202,099	2,099,334	23,296,118	97.3
Cleveland-Detroit	549,044	5,694,049	.....	.....	549,044	5,694,049	108.9
Chicago	1,092,471	12,057,677	.....	.....	1,092,471	12,057,677	101.3
Southern	245,849	3,467,693	19,657	187,498	265,506	3,655,191	72.9
Western	119,604	1,146,250	.....	6,141	119,604	1,152,391	92.8
TOTAL	5,038,605	55,955,355	57,494	609,023	5,096,099	56,564,378	96.3

During 1942 the companies included above represented 99.8 percent of the total blast furnace production.

Thompson to step UP production



The number of war plants using Thompson Grinders is an indication of the value of these machines in raising production curves. In fact, the entire line of Thompson Grinders is streamlined for high speed and ultra precision in aircraft work particularly—as illustrated by the photos on this page showing a battery of Thompson machines producing master and articulated rods for aircraft engines, and a detailed view of the setup—Thompson Grinders are helping many manufacturers to keep in step with extreme output demands, and at the same time meet today's exceptional quality-workmanship requirements. The full hydraulic action of any Thompson Grinder insures smoothness and precision, superior finishes, closer tolerances. For your sensitive, stepped-up war production, LOOK TO THOMPSON! Write for details to The Thompson Grinder Company at Springfield, Ohio.

Steel Industry Not Threatened By Light Metals, Plastics, Chemists Hear

New York

• • • **The postwar steel** industry will not be seriously menaced by the light metals, aluminum and magnesium, or by plastics, Dr. John M. Weiss, New York industrial chemist, says in a report to the American Chemical Society. Nor will the very substantial percentage growth in plastic use be a marked hindrance to light metal development, he holds.

The estimated capacity figures for aluminum and magnesium are 1,500,000 short tons of aluminum and 300,000 tons of magnesium, or only somewhat less than 2 per cent of the projected yearly steel capacity of around 96,000,000 tons, Dr. Weiss points out.

"The impact of the light metals on the steel industry can hardly be expected to be as great as the usual effects of the rise and fall of the tide of business activity," he declares. "Competition and new needs may so stimulate the alloy steels as actually to increase production and thereby bulwark the steel manufacturers. The steel industry cannot be expected to surrender tamely to light metals, even to the extent of 2 per cent.

"Even on the basis of bulk weight (one pound of aluminum has the volume of about three pounds of steel and one pound of magnesium about four and a half pounds), the percentage based on steel, even with 100 per cent replacement, is not too alarming.

"Plastics will also fight for recognition. Exact estimates of production are not available, but a safe top figure of present capacity would be less than 300,000 tons of plastics per year. Tonnagewise, the synthetic plastics represent only about 15 per cent of the projected light metal capacity."

o o o

NAM Calls the Salesman "Forgotten Man" Who Will Lead to Postwar Business

New York

• • • **The National Association** of Manufacturers nominates the salesman for the role of "the forgotten man of the all-out war," who may yet lead the country into full postwar employment.

In the 1943 Postwar Report which is to be published within the next two weeks, NAM declares that "when production of consumer goods is resumed, the volume of trade again will depend upon salesmanship."

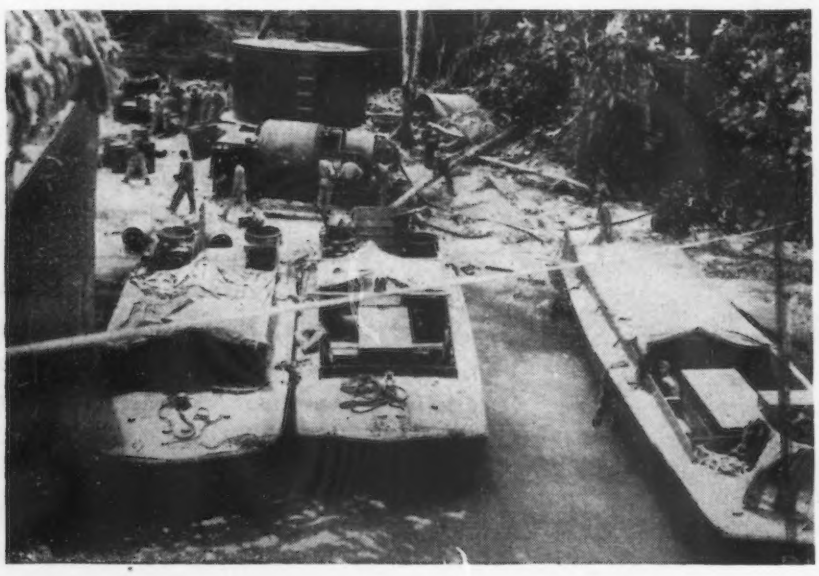
The first postwar step indicated by the report will be to get back the salesmen and distributors who are now in the armed forces or working to make things for one customer—the government. They will be needed to sell things. They do not constitute an unemployment problem, according to the NAM, but an employment solution.

"To furnish ample outlets will require the 'supercharging' of the industrial motive power by further stimulation of wants. Much attention has been directed at buying power, but it is wanting power, stimulated by salesmanship and advertising, that has nourished the tree of prosperity."

The report concludes that "there is, however, no magic or obvious short cut to radically lower distribution costs; the basic elements of distribution costs in the past are the necessary elements of distribution costs in the future, and these can not be reduced by wishful thinking."

The complete Postwar Report for 1943 is signed by Wilfred Sykes, chairman of NAM's Postwar Committee and president of Inland Steel Co., Chicago. It represents a year's work by 150 manufacturers.

G. I. DRINKING WATER: Here is a view of a water-purification and a 10,000 gallon tank on an island in the New Georgia group. This single unit produces drinking water for the entire Army group on the island.



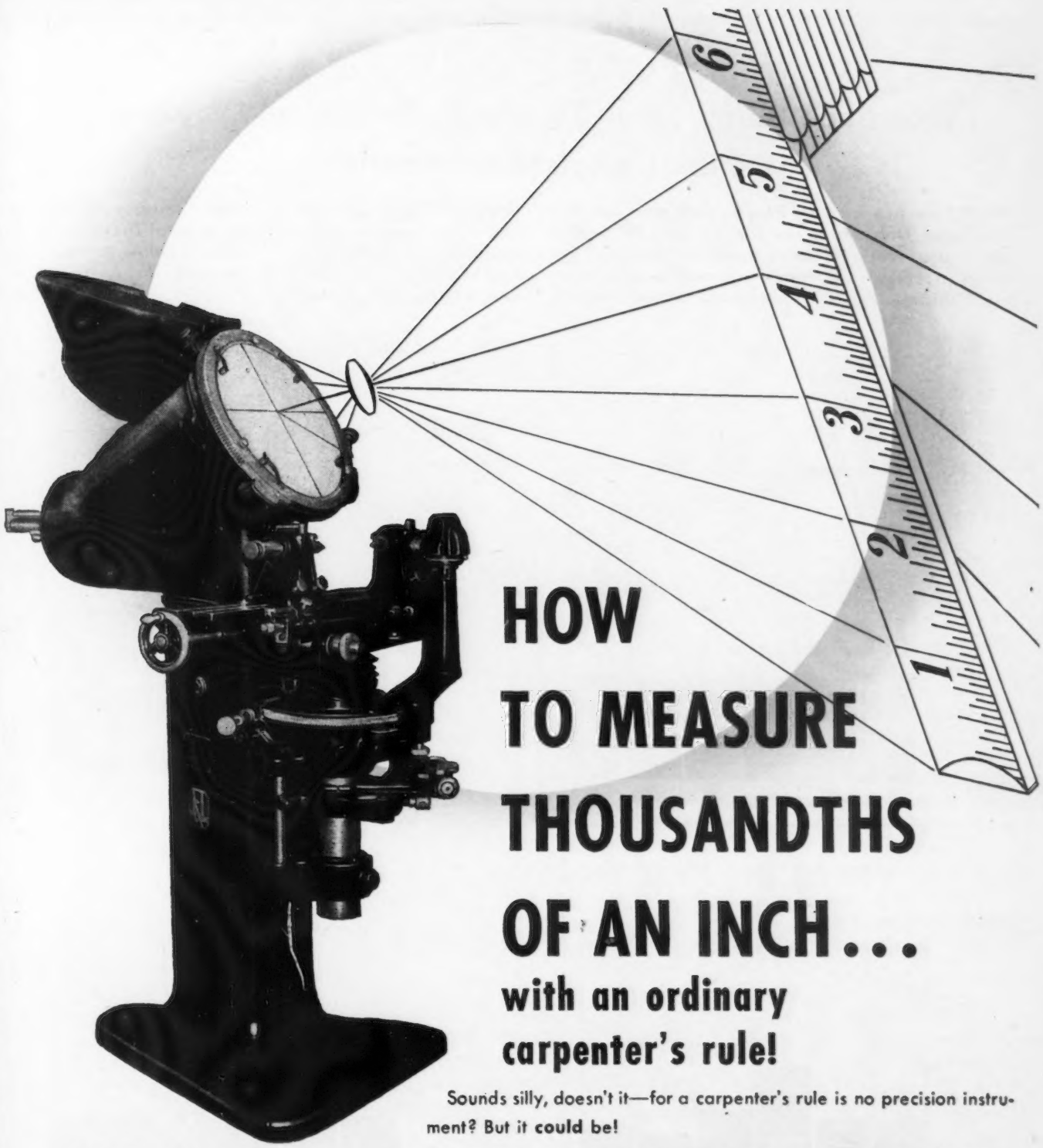
Stevens Inst. Schedules Foundry Engineering Lectures

• • • **To help meet the expanding** and diversified demands upon foundry engineering, Stevens Institute of Technology, Hoboken, N. J., announces a course of lectures on "The Fundamentals of Foundry Engineering." It will be given in the War Industries Training School of the college, Jan. 6 to March 24, in cooperation with the Educational Committee of the American Foundrymen's Association and the U. S. Office of Education.

Similar to that inaugurated by Stevens a year ago, the course will consist of a series of 24 free lectures by 17 leading engineers, foundrymen and metallurgists from war industries and from the U. S. Navy.

COMING EVENTS

Jan. 10 to 14, 1944—Society of Automotive Engineers, Detroit.
March 14, 15—National Association of Waste Materials, Inc., New York.
April 2 to 5—The American Ceramic Society, Inc., Pittsburgh.
April 12 to 15—The Electrochemical Society, Inc., Milwaukee.



HOW TO MEASURE THOUSANDTHS OF AN INCH...

with an ordinary carpenter's rule!

Sounds silly, doesn't it—for a carpenter's rule is no precision instrument? But it **could** be!

With a **Jones & Lamson Optical Comparator,** the shadow of a small metal part measuring .001" projected at 62½ magnifications would appear on the screen 1/16" thick and **could** be measured with an ordinary carpenter's rule.

Of course we do not suggest the use of a carpenter's rule in your inspection department. But you can use a technique as simple as this.

We'll be glad to help you. Send samples and blueprints to Jones & Lamson Machine Company, Springfield, Vermont.

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VT. U. S. A.

OPTICAL COMPARATORS

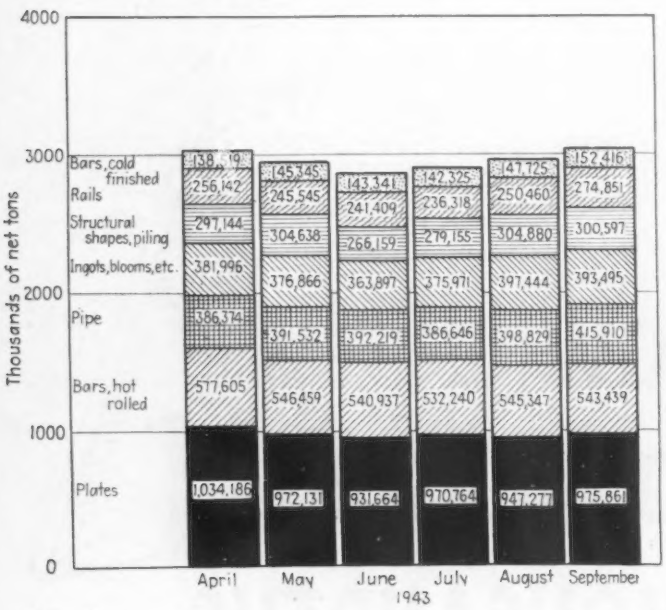
PROFIT-PRODUCING MACHINE TOOLS

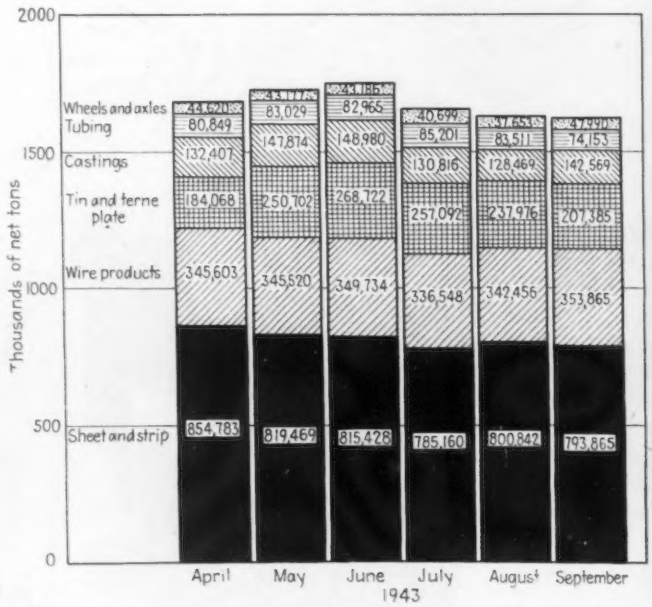
For rapid, economical inspection . . . BEYOND A SHADOW OF A DOUBT!

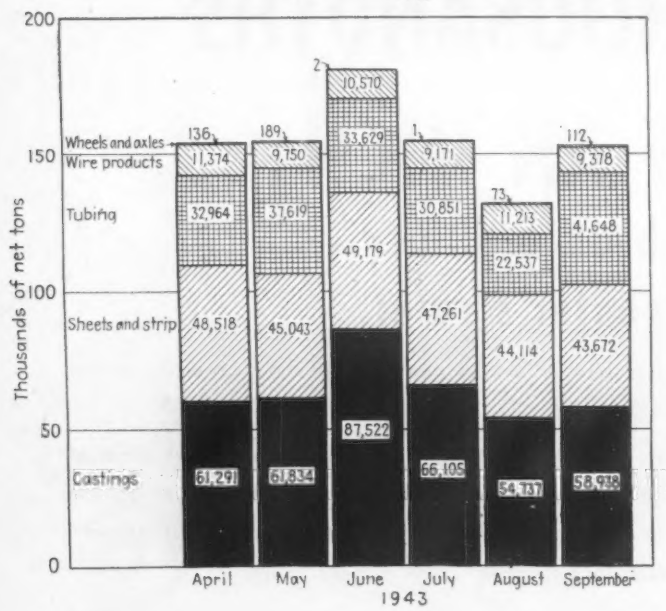
Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies

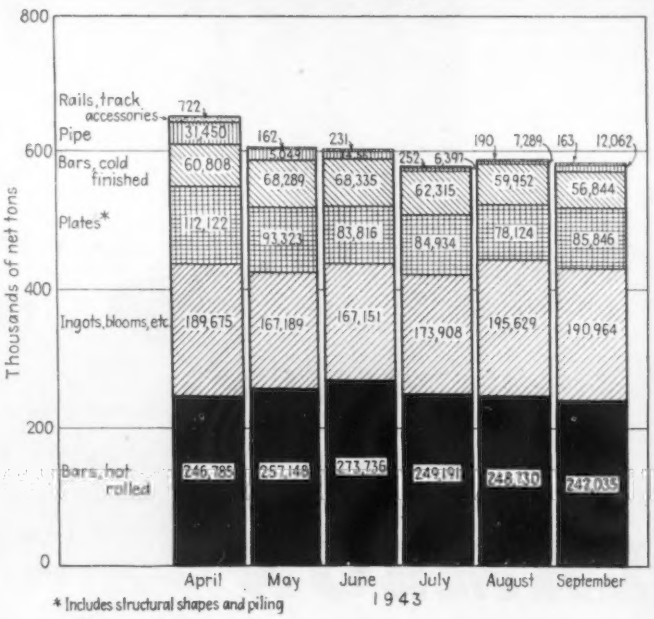
Carbon and Alloy Steel Shipments Recharted to Provide More Complete Information

• • • The two charts which appeared in this magazine Dec. 16 at the top of page 90 and at the top of page 91 were accurate, but did not cover a very wide range of carbon and alloy steel shipments. Here are more comprehensive data, recharted by this magazine from figures and charts prepared by the WPB Steel Division. The data published Dec. 16 appear below again, with additional statistics to broaden the usefulness of the information.









Output of Small Arms Ends Jan. 31 at Fedders Mfg. Co.

Buffalo

• • • Output of small arms will terminate Jan. 31 at Fedders Mfg. Co., Inc., Buffalo, according to a company announcement. Production facilities will be shifted to military aircraft heat exchangers.

Col. Frank J. Atwood, chief of the Rochester ordnance district, said the Army Ordnance Department no longer has a requirement for the capacity at Fedders but has found its manufacturing facilities "adaptable to the critical needs of another branch of the armed forces which has taken immediate steps to use these facilities."

Production of heat exchangers will result in no appreciable cut in employees, according to the company, which has been making millions of machine gun links weekly.

NICKEL AIDS THE AUTOMOTIVE INDUSTRY

to KEEP 'EM ROLLING!

Using ingenuity and "know-how" born of long experience, automotive engineers designed the phenomenally successful transport equipment that now speeds the United Nations on the road to Victory.

Built to take punishment far above peacetime requirements, these specialized military vehicles are being produced in quantity by the mass-production methods that have amazed the world. From North Africa to the South Pacific, these trucks, jeeps, tanks and half-tracks have repeatedly met wartime demands for stepped-up performance.

This kind of engineering-thinking pioneered the application of Nickel alloyed materials. Now, when uninterrupted operation is so vitally important, the continued and widespread use of Nickel is clear evidence of its many advantages.

In steering knuckles or differentials, in forged gears or cast blocks, a little Nickel goes a long way to provide essential dependability. It improves strength/weight ratios, increases wear and corrosion resistance, imparts toughness, and assures uniform properties of the other metals with which it is combined.

Today, maintenance crews on far-off battle fronts are learning what metallurgists and engineers here long have known . . . that, properly used, Nickel aids to "keep 'em rolling."

For years the technical staffs of International Nickel have been privileged to cooperate with automotive engineers and production men . . . men whose work is now so necessary to the Nation. Counsel, and printed data about the selection, fabrication and heat treatment of ferrous and non-ferrous metals is available upon request.

★ *Nickel* ★

For lists of current publications, please address Technical Library Service

THE INTERNATIONAL NICKEL COMPANY, INC., *67 Wall St., New York, N.Y.*

Pig Iron Cut-Back Halts Blast Furnace

Lorain, Ohio

• • • **The National Tube Co.**, United States Steel subsidiary, last week closed down one of the five blast furnaces operating at its Lorain, Ohio works, in the first major production cut-back at this plant, resulting from a decline in orders for pig iron. This company had closed down a blast furnace two weeks ago at its McKeesport, Pa., plant.

Operated continuously since 1937, the No. 2 furnace which suspended operations had been producing approximately 24,000 tons of pig iron a month, mostly for shipment to the finishing mills of other companies working on war orders. Lessening of orders for pig iron brought about the shutdown.

While out of operation, the stack will be relined and other repairs made so that it will be ready to resume production when other furnaces at the plant are closed down for scheduled relinings.

The approximately 30 men employed on No. 2 furnace have been offered other positions, and the company stressed that the shutting down of the stack will not result in a curtailment of production in the Lorain pipe mills and other departments, where the need for additional new employees, both men and women, continues very acute.

o o o

Southern Steel, Iron Rate Cut by Strike

Birmingham

• • • **A strike of blast** furnace workers at the Fairfield plant of the Tennessee Coal, Iron & Railroad Co. on the night of Dec. 21 banked three blast furnaces immediately and threatened the entire operations through possibility of a power shortage. Protesting a disagreement over incentive pay the workers continued their strike into the day shift of Dec. 22, while the company and the union attempted to negotiate a peace pact. By mid-afternoon of the 22nd four open hearth furnaces in addition to the three blast furnaces were out of production and all finishing mills except the plate and wire and nail mills were shut down.

Steel losses were estimated at about 1500 tons daily and iron losses about 2500 tons per day.

By evening of the 22nd recalcitrant blast furnace workers had voted not to return to work despite pleas from Carey E. Haigler, regional CIO director and R. M. Poach, representative of the union. The company had also issued a letter serving notice that all workers not back on the job by 7 a.m. on Thursday (Dec. 23) would lose seniority. This threat also brought no results.

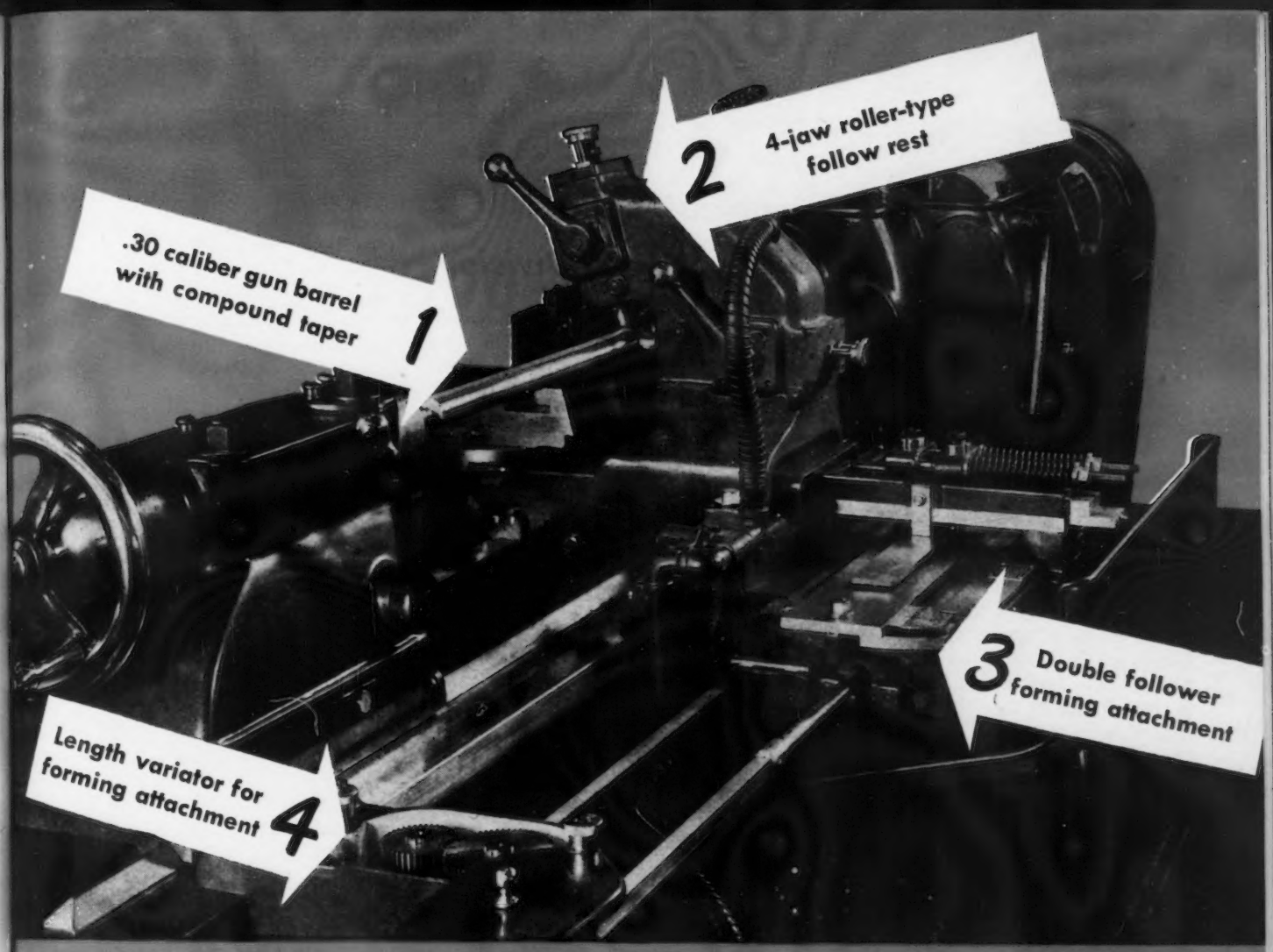
WPB Steel Division, Second Annual Dinner, Hotel Carlton, Washington, D. C., Dec. 21, 1943.

Left to right on outside—

Clark W. King, Assistant to Director, Steel Division; Paul F. Schucker, Chief, Export Steel Branch; M. W. Cole, Chief, Plate and Shape Branch; Lieut. Comdr. R. Rand, Liaison, Aircraft Resources Control Office; Walter E. Beer, Jr., WPB Legal Division; E. F. Hatch, Assistant Chief, Ferroalloys Branch; Lieut. Col. Dudley C. Roth, Liaison, Aircraft Resources Control Office; E. B. Files, Chief, Cold Finished Bar Branch; J. K. Killmer, Deputy Chief, Alloy Steel Branch; S. A. Crabtree, Deputy Assistant Director for Production; J. H. Bemis, Chief, Pig Iron Section; J. A. Rowan, Special Assistant to Director; William Kerber, Chief, Raw Materials Branch; Miles K. Smith, Assistant Director Ferroalloys; C. H. Longfield, Assistant Director and Chairman, Production Directive Committee; Norman W. Foy, Deputy Director, Steel Division; Donald M. Nelson, Chairman, WPB; John T. Whiting, Director, Steel Division; C. E. Wilson, Executive Vice-Chairman, WPB; J. V. Honeycutt, Assistant Director for Production; Joseph L. Block, Assistant Director for Program and Distribution; C. W. Meyers, Assistant Director for Raw Materials and Facilities; G. Russell Link, Chief, Merchant Trade Products Section, Warehouse Steel Branch; T. S. Fitch, Special Assistant to Mr. Block; Gerald L. McBreen, Chief, Aircraft Alloy Section; J. R. Stuart, Chief, Warehouse Steel Branch; Charles Halcomb, Deputy Chief, Distribution Control Branch; C. Sterry Long, Special Assistant to the Director, Steel Division; A. L. Meyer, Chief, Plate Section; A. A. Archibald, Chief Shell Steel Section; A. A. Wagner, Deputy Chief, Carbon, Bar and Semi-Finished Steel Branch; George F. Hocker, Chief, Forging and Casting Branch; Col. Paul Llewellyn, Liaison, Army Service Forces; W. A. Hauck, Chief, Control Branch; C. L. Wyman, Chief, Iron Ore Section; W. F. Vosmer, Chief, Carbon Bar and Semi-Finished Steel Branch.

Left to right inside—

J. W. Owings, Deputy Chief, Pipe Branch; Maj. Willard Simon, Liaison, Army Service Forces; D. F. Lacy, Chief, Pipe Branch; Lieut. N. W. Pearson, Liaison, Navy Department; Ainslie Y. Sawyer, Deputy Chief, Warehouse Steel Branch; John H. Stapleton, Secretary, Production Directive Committee; R. W. Shannon, Secretary, Production Directive Committee; Harry W. Bryant, Acting Chief, Plant Facilities Section; J. P. Larkin, Chief, Tool Steel Section; Chester E. Grigsby, Forging and Casting Branch; Torsten H. Parke, Assistant Chief, Forging and Casting Branch; R. F. Sentner, Chief, Tin Plate Branch; R. A. Marble, Chief, Shape Section; John P. Barclay, Chief, Wire Rope and Strand Section; H. M. Francis, Chief, Wire and Rope Products Branch; H. E. Hartman, Deputy Chief, Wire and Wire Products Branch; Alex Miller, Chief, Scrap Section; R. W. Frey, Chief, Surplus Inventory Branch.



How to turn compound tapers!

Compound tapers are tricky to turn, especially to the extremely close tolerances required for gun barrels. Here is how it is done fast and accurately on the Monarch form turning lathe.

1. The work—.30 caliber gun barrel with compound taper.

2. This 4-jaw roller-type follow rest has adjustable spring tension on each jaw. Eccentric levers enable the operator to engage the jaws with the work, one ahead and the other behind the cut.

3. The Monarch double follower forming attachment works from a single template, with the rear follower spring loaded. Index automatically guides the tool to produce the required shape.

4. The length variator for the forming attachment allows the use of a template which may be longer or shorter than the work itself.

With this Monarch equipment, the variations of manual control are eliminated —and of prime importance—one operator can tend two or three machines, releasing manpower for other work.

And when production of the things for better living . . . more goods for more people at lower cost . . . can start again, Monarch lathes will give as good performance as they have in war production.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

MONARCH LATHES

Save Time

Army Announces Reorganization of Quartermaster Corps' Procurement Division

Washington

• • • **Reorganization** of the Procurement Division, Office of the Quartermaster General, has been effected and now embraces several new activities, it was learned at the War Department last week.

The legal division was dissolved and its activities transferred to the procurement division. Major Gen. C. L. Corbin continues as director of procurement and will be assisted by four deputy directors, a price administrator and an administrative officer. The following responsibilities have been delegated to the four deputy directors.

The deputy director for purchases, Col. Robert T. Stevens, will assist the director in the direction of all matters related to the purchase of all items handled by the Quartermaster Corps except fuels, lubricants and their containers.

The deputy director for legal affairs and general counsel, Major William R. Compton, will handle legal matters and will supervise the operations of the legal branch.

The deputy director for inspection, Lieutenant Colonel A. H. Rogow, will handle all matters related to the inspection of all Quartermaster Corps procurements except fuels, lubricants and their containers. He will be stationed at 521 Fifth Avenue, New York, where he will be in charge of the Field Headquarters, Inspection Service, Quartermaster Corps.

The deputy director for contract adjustment, Col. Roy C. Moore, will handle matters pertaining to past and future prices on contracts and the modification and termination of contracts other than those for fuels, lubricants and their containers, and commercial warehousing service. He also will supervise the operations of the price administration, renegotiation, cost analysis and contract modification branches.

The price administrator, Mathew Dunfey, will act as technical adviser to the deputy director for contract adjustment on all matters relating to pricing policies and methods, and will exercise technical supervision over the activities of the contract price analysts in the procuring depots.

The administrative officer, Major William H. Glennon, will assist the director in the direction of administrative matters and will supervise the operations of the service branch.

o o o

Constitutionality of Renegotiation Law Contested in U. S. Supreme Court

Chicago

• • • **Constitutionality** of the renegotiation law was challenged last week in a petition filed with the United States Supreme Court by Alliance Brass & Bronze Co., Alliance, Ohio, non-ferrous foundry. Further ruling will be made Jan. 3 on the court's jurisdiction over the company's request for a writ of prohibition or mandamus to prevent renegotiation of 1942 profits totaling $392,775.

The petition charges that the law delegates judicial power to the executive department of the government in violation of the constitution. Legal precedents are cited to prove that determination of reasonableness of salaries, bonuses, and compensation, the question of whether reserves are excessive, and the matter of costs incurred by the company all have been held by the courts to be subjects of judicial determination.

Assent of the company to three contracts containing renegotiation clauses was attained by duress, it is charged, because the firm "had to choose between assent to what upon its face is a waiver of certain fundamentals or going out of business upon seizure of its plants by the United States Government."

The provision of the law making it retroactive provided payments were made after October, 1942, is unconstitutional, it is argued, because it attempts to impair a contractual obligation already consumated, thus violating the Fourteenth Amendment, Section 4, as interpreted by the courts.

Constitutionality also is questioned on the grounds that the law purports to delegate legislative power to the executive department, allows property to be taken without judicial or due process to determine just compensation, denies trial by jury and due process.

No lower court rulings have been made on the question of constitutionality of the Renegotiation Act. The initial presentation of the petition to the Supreme Court is justified by the contention that the terms of the act leaves no means by which it can be tested in the lower courts.

No claim of unreasonable or excessive profits has been made against the company, which has refused to submit to renegotiation proceedings despite threat of criminal action by the Cleveland ordnance district.

Kaiser Awarded 27 Victory Ships

Washington

• • • **The shifting emphasis** in merchant ship construction is indicated by announcement that a contract for 48 tankers held by the Kaiser, Vancouver, yard has been cancelled upon orders of the Joint Chiefs of Staff, and a contract for 27 Victory ships substituted. Tanker tonnage at the close of 1943 is in a better position than was expected in the middle of the year, due to excellent anti-submarine measures, thus permitting a slackened rate of new tanker construction.

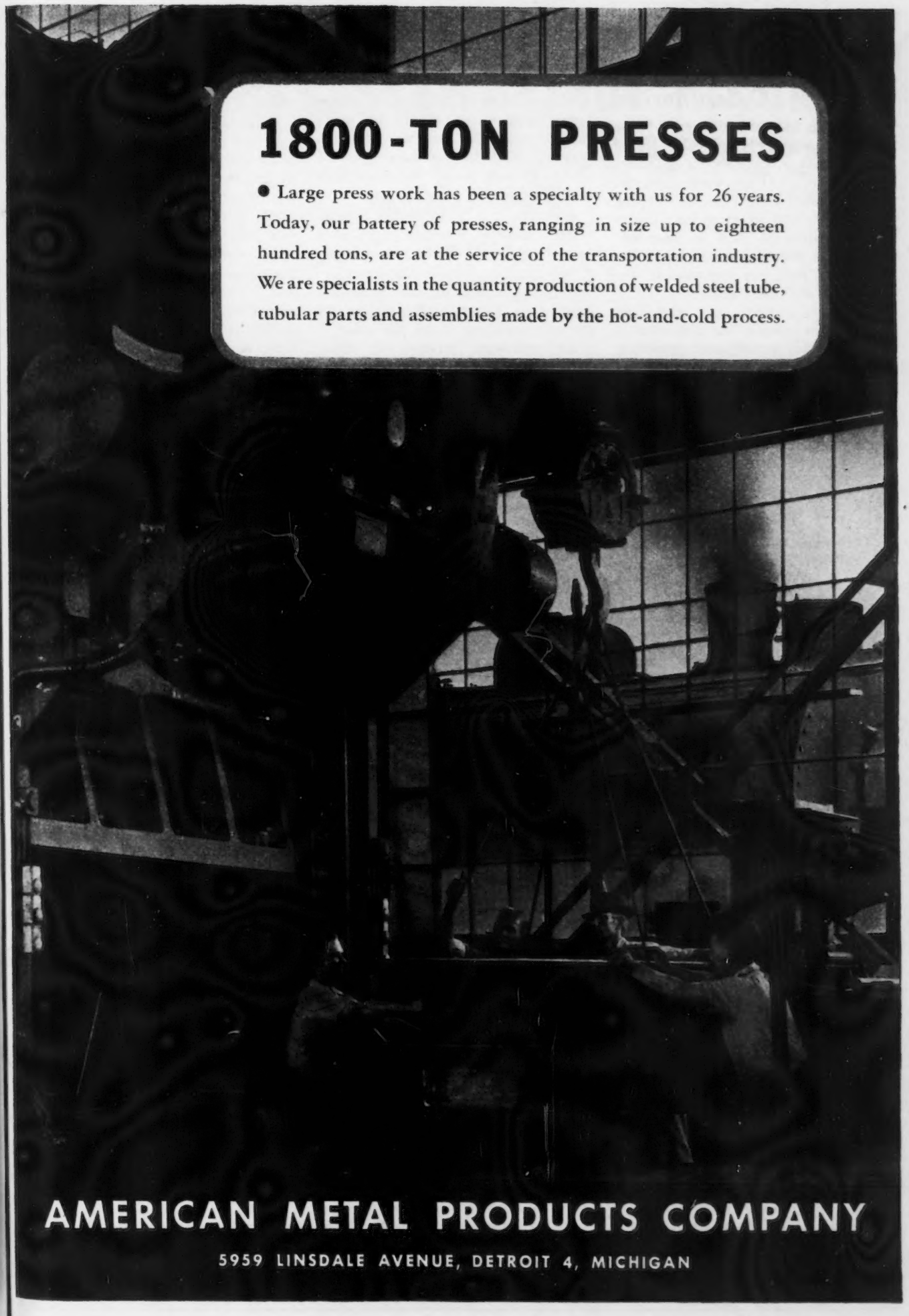
At the same time the demand for Navy vessel types—auxiliaries and landing craft principally—has been squeezing Victory ships out of the way schedules. The contract shift announced today assures Victory ships of a fair position in the changing 1944 program. The cancelled tankers will come in later in the year if capacity should become available.

Cancellation of the contract and approval of the award to build 27 Victory ships was announced Dec. 21 by the Maritime Commission.

Delivery of the 27 Victory ships and completion of the contract is expected by the end of August, 1944, Commission officials indicated.

G-M Production Up

• • • **In the two years** since Pearl Harbor General Motors has produced a total of more than $5,000,000,000 worth of war materials and is now producing at a rate exceeding $12,500,000 a day, C. E. Wilson, president of General Motors, announced recently.


1800-TON PRESSES
• Large press work has been a specialty with us for 26 years. Today, our battery of presses, ranging in size up to eighteen hundred tons, are at the service of the transportation industry. We are specialists in the quantity production of welded steel tube, tubular parts and assemblies made by the hot-and-cold process.
AMERICAN METAL PRODUCTS COMPANY
5959 LINSDALE AVENUE, DETROIT 4, MICHIGAN

Mine and Smelter Orders Revised

• • • WPB has issued order P-56 as amended, making many changes in the original order relating to mines and smelters. At the same time, the board revoked order P-58, as amended and order P-73 as amended. Under the provisions of P-56 as amended: Operations formerly conducted under P-58 and P-73 are included in the definition of "producers."

Capital additions not exceeding $500 are included in the definition of "maintenance, repair and operating supplies." Until forms can be revised, operators must apply by letter for a dollar quota for the purchase of these minor capital additions. These letter applications should be made immediately. No capital additions may be subdivided for the purpose of bringing them under the provisions of this order.

Smelters and refiners are placed under the same inventory provisions as previously applied to mines under P-56.

Sales of excess or idle materials covered in Priorities Regulation 13 are now permitted under the order.

All privileges granted in other WPB orders to persons operating under Priorities Regulation 5 are permitted producers operating under this order.

Mines and smelters desiring to obtain machinery or equipment must make prior application to the WPB mining division. For authorization to buy MRO supplies, where a preference rating is necessary, they must also make prior application.

Preference rating assistance accorded persons operating under P-58 and P-73 will hereafter be given under P-56, as amended. Operators serialized under P-58 and P-73 will continue operations with the same serial numbers under P-56.

Production, Consumption, and Stocks of Ferro-Alloy Materials During War and Pre-War Periods

Metal	Unit	Production		Consumption	Stocks Dec. 31, 1943
		Domestic	Foreign		
Chromium Ore					
War	Gross Tons	100,000	865,000	900,000	1,100,000
Pre-War	Gross Tons	1,506	361,367	362,873	.....
Manganese Ore					
War	Gross Tons	175,000	1,105,000	1,400,000	1,525,000
Pre-War	Gross Tons	30,683	643,900	674,583	.....
Rutile					
War	Short Tons	3,700	14,000	16,000	6,400
Pre-War	Short Tons	1,942	508	2,450	.....
Zircon					
War	Short Tons	200	14,000	21,000	12,000
Pre-War	Short Tons	0	3,713	3,713	.....
Cobalt					
War, convertible to usable products with existing facilities	Pounds	436,000	4,186,000	4,588,000	5,873,000
War, not convertible to usable products with existing facilities	Pounds	0	961,000	0	961,000
Pre-War	Pounds	0	1,670,000	1,670,000	.....
Molybdenum					
War	Pounds	58,726,000	3,834,000	53,825,000	29,674,000
Pre-War	Pounds	23,130,200	19,550	23,149,800	.....
Tungsten					
War	Pounds	10,274,000	15,810,000	17,151,000	18,683,000
Pre-War	Pounds	2,803,600	2,244,100	5,047,800	.....
Vanadium					
War, V205, Ferrovanadium and Miscellaneous Alloys	Pounds	.....	.....	3,347,000	2,798,000
War, Ores	Pounds	3,497,000	1,987,000	.....	1,952,000
Pre-War	Pounds	633,600	886,000	1,519,600	.....
Nickel					
War	Pounds	1,000,000	210,889,000	205,030,000	18,048,000
Pre-War	Pounds	518,400	74,462,000	74,980,400	.....
Ferrosilicon					
War, Gross Weight	Gross Tons	782,000	.....	782,000	128,900
War, Silicon Content	Gross Tons	240,000	.....	240,000	42,200
Pre-War, Gross Weight	Gross Tons	291,700	.....	281,700	.....
Pre-War, Silicon Content	Gross Tons	72,100	.....	72,100	.....

Note: War = 1943 Pre-War = Annual (Average 1935-1939 incl.)
Pre-War consumption estimated by adding pre-war domestic production and imports.
All quantities for cobalt, molybdenum, tungsten and vanadium have been adjusted to a basis of recoverable metal or equivalent after deducting refining losses.

Dec. 13, 1943

FITCHBURG GRINDS ACCURATE TO .000025"

ASK FOR YOUR COPY

CONTINENTAL MACHINES
Incorporated
1301 WASHINGTON AVENUE SOUTH
MINNEAPOLIS

October 8, 1943

The National Machine Tool & Supply Co.
Att: Mr. C. O. Hanson
13 No. 1
Minneapolis, Minnesota

Dear Mr. Hanson:

I believe you will be interested in a job which we performed on the Fitchburg Grinder recently purchased from you.

The job consisted of grinding the O.D. of a piece of hollow tubing 1-1/2" in diameter and approximately 4" long. This part is used as a master squaring gage, and the grinding had to be held to extremely close tolerance of accuracy. Several attempts were made to grind the part by conventional holding methods, but it was found that upon releasing the work from the arbor it would distort beyond the limits to which the part had to be held. We finally devised a method of holding the tubing during the grinding operation, and using the Fitchburg Grinder we were able to grind 100 of these parts to an accuracy of 25 millionths maximum taper over the 4" length, and within 25 millionths of concentricity.

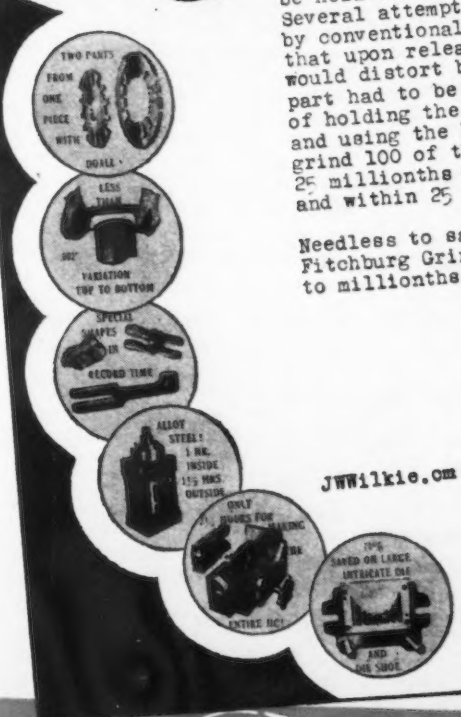
Needless to say, we are very well pleased with our Fitchburg Grinder when we can use it to grind down to millionths in accuracy.

Yours very truly,

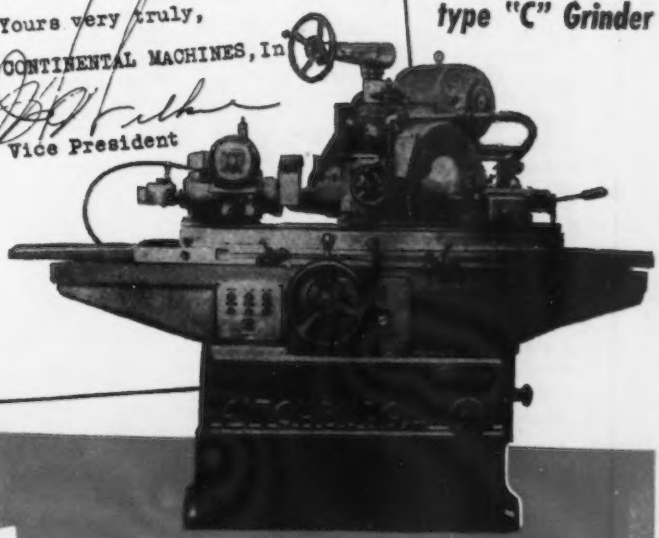
CONTINENTAL MACHINES, Inc.

Vice President

JWWilkie.cm



Unsolicited letter received by Fitchburg regarding type "C" Grinder



FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

Index of Some of the Leading Topics Bearing on Post-War Era Which Have Appeared in News Section in Recent Months

Probable Markets in Post-War Era for Porcelain Enamel Projected by Institute

Pittsburgh

• • • **The** Porcelain Enamel Institute, preparing for post-war developments, has adopted a program which will insure active market development after the war.

Two approaches were employed. A research committee explored all factors pertaining to the market, and a development committee went into action on a specific promotional program. The Market Research Committee was made up of the following men:

Robert J. Ritchey, chairman, Carnegie-Illinois Steel Corp.; W. H. Brett, Alliance Porcelain Products Co.; E. G. Walbridge, Erie Enameling Co.; Milton Gallup, Porcelain Metal Products Co.; Edward Mackasek, Beaver Enameling Co. The Market Development Committee was composed of:

R. A. Dadisman, chairman, American Rolling Mill Co.; B. F. Birdwell, Porcelain Metals Corp.; Dana Chase, Chicago, Vitreous Enamel Products Co.; E. A. Headland, Enamel Products Co.; J. Fred Ingram, Ingram-Richardson Mfg. Co.; H. D. Thompson, Chattanooga Stamping & Enameling Co.

Determining the total demand was a complicated problem because applications for porcelain enamel products were numerous and a wide variety of industries were sold. In order to simplify the picture for proper analysis, end-use products were classified by intermediate consumer groups. After over-all examination of market potentials, the industry study was set up under major classifications. Under these classifications, essential items for which porcelain enamel was adaptable and acceptable were classified. After this initial breakdown, the next step called for a study of two types of general markets for each product; namely, the replacement and the potential new market.

Basic data for each major product under each industry classification were obtained from various sources. Some of the material was found for production by unit and dollar value in publications of the Census of Manufacturers. After an accumulation of all available material, estimates were made for a low or immediate demand (as will be presented at the close of the war) and a high or full potential market accumulated to 1950. In some instances, the average production rate in the past ten years was used as a basis. In others, production in 1937 or 1939 was used in that both of these years could be interpreted as nearly normal. The accumulation of the probable annual production for eight years to 1950 was increased or decreased to allow for any important long term trends of the past. In other cases, certain units of a ten year life, sold during the ten year period before the war, would be subject to replacement during the ten year period after war regulations terminated production. In other words, in spite of wartime regulations, materials and equipment will wear out and with repair facilities being at a premium, a demand was accumulated which would have to be placed into the total market picture.

These figures for the low or immediate demand were expanded to show the full potential market as additional factors were considered. Development technological advances and promotion, play an important role. Postwar economic stabilization plans and re-employment programs play their part. Projection of new family formations and the increase in family desire for ownership were factors.

Finally, all tabulations by major products by industry were then converted into porcelain enamel values.

Complete figures on each product in each individual market were prepared and submitted in addition to the above general summary.

With regard to the individual company or internal sales analysis, the following procedure was recommended to the individual members of the Institute by the Market Research Committee:

1. Convert data in tables from a unit or dollar basis to square feet, tonnage, or dollar value for comparison with company records.

2. Calculate the company's percentage of participation in the 1939 porcelain enamel markets by product groups.

a. Appraise past performance with old customers, and ability to improve this established position.

b. Evaluate opportunities to grasp new accounts through solicitation of broader product application and introduction of new products.

c. Weigh probable effects of direct competitor's and competitive materials. This includes customer's opinion of competitive materials.

3. Based upon past performance, new opportunities and handicaps, determine firm's logical percentage of future business.

4. Apply percentage of expected participation to (a) the accumulated immediate demand, and (b) the full potential market for 1950 in order to visualize company's appropriate share.

5. Compare these estimates to past and present capacity of the company to discover which manufacturing divisions of the company appear to be over-expanded and, on the other hand, which may require expansion.

6. If a production surplus is apparent or an improved product mix is necessary to obtain a larger amount of more profitable items, another step is required. Reference to post-war market estimates in the report may serve as a helpful guide in your selection of items for diversification of production.

Porcelain Enamel Market

Market Group	1939 Porcelain Enamel Market (Actual & Possible)	Porcelain Enamel Values Accumulated to 1950	
		Immediate Demand	Full Potential Market
TOTAL	$213,613,000	$1,635,120,000	$3,083,457,000
Agricultural	2,215,000	15,657,000	43,373,000
Household (Includes major appliances)	63,548,000	484,056,000	682,121,000
Institutional	3,474,000	24,089,000	30,479,000
Commercial (Includes signs, refrigerators and equipment)	39,894,000	310,942,000	372,274,000
Construction (Includes structural items and building equipment)	97,082,000	752,460,000	1,892,410,000
Industrial	7,400,000	47 816,000	62,800,000

USES Lifts Control Over War Workers Entering Cleveland

Cleveland

• • • **Control of in-migration** of war workers into Cleveland was terminated recently, with the announcement that the United States Employment Service will admit into the area all persons willing to take war-essential jobs if they have evidence of being properly cleared out of the area of former residence or possess credentials showing they were released from their last employment. The ban was lifted because of Cleveland's classification as an area of acute labor shortage and because residents could not be found to fill the war job vacancies hurting armament production most.

How *Brass* helped to give everybody *The Time of Day*

AROUND the middle 19th century, the wooden clock business began to run down. Seasoned, dampproof wood "cost too dear" . . . which killed export and crippled trade with southern states. Still, what was home without a timepiece? And the answer to that question was the brass-geared, one-day clock, which undersold and outperformed the fanciest wooden models. Travelling Connecticut Yankee peddlers sold them like proverbial hot cakes, all over the country.

In those days, this organization was known as "The Bristol Brass and Clock Company," and many an honest old Bristol Brass clock is ticking to this day. . . . Likewise, today's Bristol Brass organization is ticking more swiftly, smoothly, and strongly than ever before in its history . . . turning out no more clocks, but rolling out endless miles of brass sheet, rod, and wire to help blast a path to permanent peace, at the end of the fifth war in which Bristol has served U. S. munitions makers. . . . When that day comes, Bristol will be ready to place at the disposal of brass-fabricators the benefits of its intensive wartime brass-mill experience . . . and to help develop new uses for the ageless alloy which, in countless instances, has never had a completely satisfactory substitute.

THE

BRISTOL BRASS

CORPORATION

Makers of Brass since 1850, Bristol, Conn.

WPB Continues Metals Relaxation

Washington

• • • **Almost daily relaxation** of controls over various heretofore critical metals can be seen as supplies ease and substitution becomes less necessary. Most prominent in the last week have been the removal of pig iron from allocations and the release of copper and copper base alloys in two formerly limited applications.

As predicted in this magazine Dec. 23, page 87, pig iron formally was removed from allocation by WPB, effective Feb. 1, due to a balancing of supply with demand resulting from expanded production. GPO M-17 as amended accomplishes this relaxation but retains certain controls so that WPB may still direct material flow when necessary.

Copper supplies are being released to permit production of certain parts for the expanded 1944 truck program and all restrictions over the use of copper in lubrication equipment have been removed during the last week.

In an amendment of L-106 the WPB permits the use of copper in the new truck program but still specifically restricts its use in the replacement parts program.

Through an amendment to L-314 and M-9-c the WPB has fully released copper and copper base alloys in the manufacture of lubrication equipment and has also postponed the reduction of the number of models of such equipment permitted for manufacture.

Copper and copper base alloys were also released the previous week for use in builders finishing hardware, cabinet locks and padlocks through an amendment to L-236. Other copper and copper base alloy relaxations recently have permitted use of these materials in certain types of fuses and other electrical equipment.

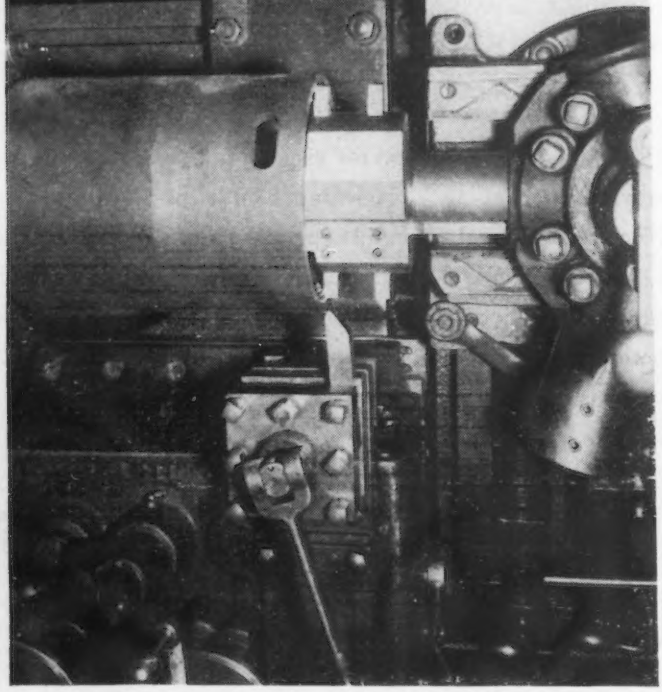
Nickel and chromium were also released recently for use in truck engine valves as a part of the 1944 expanded truck program.

o o o

Amend Specifications on Hot-Rolled Bars

• • • **WPB has issued** L-211, limiting the specifications on hot-rolled carbon steel bars. The limitations were intended to apply primarily to bars used for reinforcing. In view of the uncertainties existing in the trade, it has been found necessary to issue Interpretation 1 to Schedule 15 under L-211 to designate those bars to which the limitations do not apply. Exempted are carbon file steel bars, which are considered to be tool steel bars, and wrought iron bars.

The restrictions of the schedule apply generally to production and delivery and not to use. For example, although carbon steel bars in the dimensions listed under the heading "nut-steel flats" are chiefly used for the manufacture of nuts, the schedule does not prohibit the production or use for other purposes of sizes permitted under this category.



DOUBLE ACTION: *Ford Motor Co. has more than doubled output of operators machining molds for centrifugal casting equipment by utilizing a double-end high speed steel cutting tool. The tool is shown above on a vertical turret lathe in the tool and die building at the Rouge plant. Two sets of cutters are used, one for roughing and one for finishing; and another tool finishes the outside of the mold. By machining at opposite areas of the i. d., the uneven torque incidental to slow operation is said to be eliminated.*

•

Copper Released For Lubrication Equipment

• • • **All restrictions** are now released on the use of copper and copper-base alloys in the manufacture of lubrication equipment. At the same time WPB postponed the effective date of the restrictions on the number of models, sizes and styles of such equipment until some time to be determined later. The amended order also specifies that marine suppliers and others may continue to use form WPB-646 in addition to other forms. This action was taken through an amendment to Limitation Order L-314. The Order also makes clear that it does not prohibit the use of other preference rating certificates, such as WPB-646, for marine suppliers, in addition to form WPB-547 (formerly PD-IX) by any person who is entitled to use such other forms in applying for preference ratings.

•

NE Stainless Steels Again Going to Warehouses

Washington

• • • **Inasmuch as the** supply of stainless steel is improving, WPB has decided to lift in part its restrictions on the distribution of all grades through warehouses. The situation with respect to alloy steel, at the present time, makes it possible for the WPB to permit warehouses handling such material to order hot rolled or cold finished alloy steels in either the NE-8600, NE-8700, or NE-9400 series. Beginning immediately, steel producers will be permitted to schedule for melting authorized controlled material orders received from warehouses calling for the delivery of steel in any one of the NE-series mentioned above.

9 Factors Affecting the Life of Wire Rope *(Continued)*

{This is number 18 in a series of articles prepared by Macwhyte Wire Rope Company for the benefit of wire rope users everywhere. All articles in this series are yours for the asking. Macwhyte Engineering Experience is available on specific problems.}

★ ★ ★

In the previous article of this series, the first four of nine factors affecting wire rope life or service were discussed. They were:

1. Abrasion or Wear
2. Bending or Flexing
3. Tension or Stress
4. Speed

As the article pointed out, these four can be kept from doing too much harm (to rope and machine) by frequent checkups.

While some of the four factors mentioned above are normal and to be expected, there are five other "rope saboteurs" which are *not* normal. These can be corrected. They are:

5. Crushing or Mashing
6. Weathering or Corrosion
7. Jerking or Shock
8. Vibration
9. Heat or Friction

What can you do to correct them, and thus save steel and time now so urgently needed? Here are specific suggestions.

Crushing or Mashing

Improper winding (criss-crossing) on the sheaves or drums results in crushing or mashing. It *pays* to start the rope winding properly. Keep it from criss-crossing and reduce scuffing against the flanges of the drum and against the under layer to a minimum.

Where rope is loose on the ground (on incline slopes especially) it pays to prevent trucks or equipment from running over the rope. Lubricate rollers, sheaves, and guides so as to avoid undue abrasion. When rope jumps a sheave, stop and replace it before continuing the operation.

Permanent injury to the rope and damage to equipment can result if a rope is operated while out of its proper sheaves. In clamping or fastening the end of the rope use care to avoid needless damage.

Weathering or Corrosion

Wire rope is made of high carbon steel wire and will rust and corrode if not properly protected by a suitable lubricant, especially if it is not in constant use. Proper lubrication keeps the rope flexible and reduces wear as well as affording a protection against corrosion. (See article 10 in this series.)

Jerking or Shock

If there is slack in a rope, take it up slowly before the load is applied. This is where the human element enters the picture. Many a rope is ruined for lack of care on the part of the operator. A quick pickup with as little as 12 inches of slack will more than double the load on the rope and may cause it to snap. Even if the rope doesn't break immediately, it is weakened and breaks later in normal operation. (See article 15.)

Vibration

Vibration of wire rope in service fatigues the steel wires and consequently "tires" them out before they wear out. It is difficult to correct this except where this vibration is caused by faulty equipment and hurried handling. A clutch or brake may chatter and this vibration is multiplied many times throughout the length of the rope. Vibration may cause rope to break where it is dead ended (fastened). Where wire rope is fastened in a socket, continuous vibration will cause the wires to break right at the socket—cutting off a short section and refastening is a cure for this. A smooth pickup and steady operation will do much to eliminate vibration.

Heat or Friction

Heat changes the structure of steel. In general, it hardens it or makes it more brittle. Friction creates heat. Lubrication helps reduce friction. A stuck roller, a poorly aligned sheave, scuffing against wraps of rope on a drum, scraping on rock or metal creates friction and heat. Wire rope must be kept free to do its job of bending. Heat and friction will change its steel composition and cause it to break up prematurely. Where ropes travel at high speed, watch out for the effects of heat.

Not EVERY Enemy is found on the battlefront. Look...

Killed through Carelessness. Literally chewed to death, this rope was ruined before showing any normal wear.

Unnecessary Abrasion. A hoist rope was allowed to saw through a heavy plate. Such waste can and should be avoided.

Mashed to Death. Criss-crossed on the drum, this rope gave only a fraction of the service it might have, had more care been used in spooling.

Why Such Waste? This rope has been cutting a number of grooves in the bucket rim. It will give poor service and increase operating costs.

Your Wire Rope Requirements

The benefit of years of experience based upon servicing equipment similar to yours is gladly given. When you ask Macwhyte for suggestions and recommendations, you can be assured not only of getting "The Correct Rope for Your Equipment," but also a personal interest in helping *you* get the most out of *your* rope.

Feel free to consult with Macwhyte distributors, Mill Depots representatives, or write to Macwhyte Company direct.

MONARCH WHYTE STRAND PRE-FORMED WIRE ROPE

... Macwhyte's best grade wire rope, famous for its strength, toughness, preforming, and internal lubrication.

NO. 698

WPB Tightens Restrictions on MRO

Washington

• • • **WPB has issued** an amendment to Priorities Regulation No. 3, including Interpretations Nos. 1-7, providing that blanket MRO ratings may not be applied to get any item on List B, except as permitted by that list, and adds to the list chemicals; closures and closing devices required for packaging products to be shipped or delivered; laboratory instruments and equipment parts; lighting fixtures, fluorescent, incandescent and electric floodlights (blanket MRO ratings of AA-2 or higher may be used here, however); slide rules, precision and engineering, having a list price of $7.50 or more; and woodworking machinery as defined in L-311 costing more than $50.

WPB also announced that Lists A and B of this regulation will be generally revised about the 15th of every second month, with the next revision to be expected about Feb. 15, 1944.

In an amendment to Interpretation No. 3, it is provided that preference ratings assigned to the delivery of MRO supplies may be used to obtain repair parts and materials for existing fire protective equipment, but may not be used to obtain end items of such equipment.

o o o

OPA Establishes Used Valve Prices

• • • **Moving to restore** the normal price relationship of used and reconditioned valves within the industry and to halt the sale of used valves as reconditioned valves, the OPA established a method of price computation for both types.

A more effective method of price control to prevent further price increases and misrepresentation is provided as follows:

1. The maximum price for any reconditioned valve shall not be in excess of 80 per cent of either the original manufacturers' net price to jobbers for the new valve or any other manufacturers' net price to jobbers for a new valve of identical type.
2. The maximum price for any used valve shall not be in excess of 40 per cent of either the original manufacturers' net price to jobbers for the new valve or any other manufacturer's net price to jobbers for a new valve of identical type.

The maximum prices are fixed f. o. b. the seller's usual place of business, except that no additional charge may be made for local delivery if a free local delivery was maintained by the seller during the month of March, 1942.

The amendment also requires that a tag be affixed to each valve stating by what process it was reconditioned.

Amendment No. 69 to Revised Supplementary Regulation No. 14 to the General Maximum Price Regulation, effective Dec. 29, 1943.

o o o

OPA Increases Price Of By-Product Gas Coke

Washington

• • • **An increase of** 30c. per net ton in the producers' ceiling price of by-product and retort gas coke produced in some mid-Western and Southern states was announced Dec. 20 by the OPA.

The increase is applicable to these types of coke produced in Alabama, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Tennessee, Wisconsin, and that part of Ohio west of a line running North and South through a point immediately west of Cleveland.

The new ceiling price for by-product coke sold for use in a foundry cupola at Chicago is $12.60 per net ton, f.o.b. oven plant in cars, as compared with $12.30 previously, and the new ceilings at other basing point cities in the mid-West have been given identical 30c.-per-ton increases.

The increases were authorized, OPA said, to compensate producers for additional labor and coal costs. The action is taken in amendment No. 1 to MPR No. 29 effective Dec. 20, 1943.

•

Increased Prices Set For Connellsville Coke

Washington

• • • **An increase to $7.75** per net ton from $7 in the producers' ceiling price for beehive oven coke produced in hand-drawn oven, f.o.b. Connellsville, Pa., was announced Dec. 20, by the OPA.

A rise in the ceiling price for machine-drawn coke to $7 from $6.50 was also announced. Both increases are effective as of Nov. 29, 1943.

The increases were authorized, OPA said, to compensate producers for additional labor and coal costs. The action was taken on amendment No. 1 to MPR No. 77, effective as of Nov. 29, 1943.

•

Schedule Operating For CMP Allocations

Washington

• • • **Small consumers** of controlled materials—steel, copper and aluminum—will have their 1944 allotments made upon an annual basis. Only larger consumers will be required to get their allotments quarterly. In their case the division of the materials will be made up somewhat earlier for the second quarter of 1944.

The following time table has been assigned for computing the second quarter allotments:

DEC. 15
Claimant Agencies submit unit requirements for Class B, Class A Civilian Type, Programmed B and Special B products to Industry Divisions concerned. (Completed)

DEC. 20
Interdivisional reports on unit requirements for B product components. (Completed)

DEC. 22
Industry Divisions, upon request, furnish Claimant Agencies with translation of unit requirements into controlled material. (Completed)

JAN. 1
Industry Divisions submit requirements for all products, for consolidation by General Statistics Staff.

JAN. 1-8
Period for revision and resubmission of requirements.

JAN. 19
Summarized requirements submitted by the Operations Vice-Chairman to the Program Bureau and the Controlled Materials Divisions.

•

WPB Removes Pig Iron from Allocation Feb. 1

Washington

• • • **As predicted** in THE IRON AGE of Dec. 23, WPB has issued General Preference Order M-17, as amended, removing pig iron from allocation Feb. 1.

Beginning Jan. 1, producers will be required to file simplified monthly reports on production, shipments and inventory, rather than the more complete forms required heretofore.

•

Food Machine Ruling

• • • **Interpreting L-292,** WPB on Monday said that "approved orders" for food processing machinery include orders that bear a rating of AA-5 or higher and are assigned on specified forms.

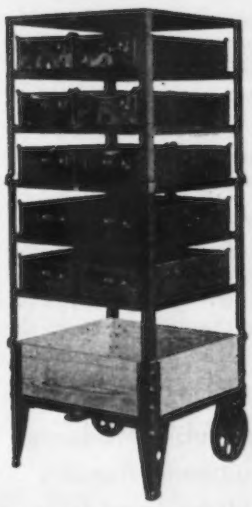
NEED SPACE???

Let the

TURNER SYSTEM
OF MATERIALS HANDLING

Enlarge Your Factory—without enlarging buildings

When extra space is needed *in a hurry*, the scientifically engineered Turner System will provide it for you. This remarkable system saves up to 50% floor space by its mathematically 100% efficient method of handling and storing materials. No need to enlarge buildings. No need to install expensive overhead equipment. The Turner System, already proved in many of America's largest plants, will do the job better—at an immense saving in cost.



Application of Bin Section and two Shop Box Racks to Transport to provide portable stock or parts service.

Interlocking Bin Sections on Transport expand loads vertically as required.

Built on the Principle of the SQUARE

The Turner System is a completely standardized scheme of interlocking and interchangeable units which can be applied to every plant operation. Its foundation is the perfect square upon which is built an amazingly flexible and efficient materials handling and storing procedure.

Send for Explanatory Book

Factory Service Company will send without charge to established companies its twenty-page book explaining the Turner System. Write for it today.

FACTORY SERVICE COMPANY

4621 N. Twenty-First Street — Milwaukee 9, Wisconsin

Surplus Inventories of Tinplate Must Be Reported

Washington

• • • **Producers of tin** plates, short ternes and tin mill black plates will hereafter report to WPB all allotments to can manufacturers which have not been shipped at the end of each month. These reports will disclose the speed at which can manufacturers are making use of the material that has been allotted them under the Controlled Materials Plan.

The notice, under the signature of J. T. Whiting, Director of the Steel Division, reads: You are requested to report by letter as of the close of each month beginning with December, 1943, the total consolidated number of base boxes of tin plates, short ternes and tin mill black plates produced for can manufacturers which you had produced against CMP allotments but had not shipped at the close of the month reported.

The above letter should be addressed to Tin Plate Branch, Steel Division, War Production Board, Washington 25, D. C., and mailed not later than the tenth of the month following the reported month.

•

Copper Tubing Released For Equipment Repairs

• • • **WPB has issued** Direction 1 under CMP Reg. 9A, telling distributors of automotive equipment, heating equipment (gas or oil burning), and refrigeration equipment how to get copper tubing to sell to repairmen for use in repairing such equipment. Distributors who were in business on Aug. 1, 1943, may buy copper tubing under this direction. A distributor may order in any calendar quarter up to 6000 lb. of copper tubing, endorsing such order with the CMP allotment number V-3 and the usual CMP certification. If a distributor needs more copper, he may apply to WPB. Distributors may not have more than a 30-day inventory.

Contracts for Frigates Cancelled Because of Lag

Cleveland

• • • **The Maritime Commission** on Dec. 24 cancelled contracts with American Shipbuilding Co. for four frigates because of "unsatisfactory progress." The commission contracted originally with the company for 17 frigates.

O.H. Stainless Steel Directive Revoked

• • • **The War Production Board on Dec. 23 revoked Direction 2 to Supplementary Order M-21-a which had required that certain alloy steel be produced only in electric furnaces. The direction is now revoked because it has served its purpose of freeing open hearth capacity for carbon steel production, and there now exists sufficient open hearth capacity to make the restriction unnecessary.**

Copper Released for Use In 1944 Truck Production

Washington

• • • **To implement the** expanded 1944 truck program, WPB is releasing metals which a short time ago were sharply restricted as to use. Last week chromium and nickel were released for truck engine valves, and now WPB has lifted all restrictions on the use of copper for parts going into the expanded truck program. The restrictions on the use of copper in replacement parts are not changed. In another order, the use of copper and alloys for production of lubrication equipment is permitted.

WPB last week lifted all restrictions on the use of copper in the manufacture of parts for the new vehicles that will go into the expanded 1944 truck production program. The action, which is included in an amendment to Limitation Order L-106, is designed specifically to facilitate the output of parts for new trucks and does not lift restrictions on the use of this metal for replacement parts production.

Small Plants Fill 187,947 Contracts

Washington

• • • **Prime supply contracts totaling 187,947, with a value of $4,658,028,000, were placed by the War Department with industries employing less than 500 workers during the twelve months ending Oct. 31, 1943, the War Department announced.**

Army Service Forces, during this twelve months' period, let 256,731 prime supply contracts with a total value of $19,522,-241,000. Of these, 169,349 contracts, representing $4,230,073,-000, were placed with firms employing 500 or fewer workers.

CMP Developments

• Dir. 39 to Reg. 1 establishes the "CMP Product List" contained in "Products and Priorities" as the only official list of Class B and Class A Civilian Type End Products.

•

• Dir. 9 and 11-Reg. 5—Revoked. (12-20-43)

•

• Dir. 1-Reg. 9A—Distributors may now purchase up to 6000 lb. of copper tubing per quarter using the V-3 symbol and certification.

Price Briefs

• MPR 77-Amend. 1—Increases hand drawn beehive furnace coke at Connellsville, Pa., from $7.00 to $7.75 and machine drawn from $6.50 to $7.00 per net ton f.o.b. ovens. Effective Nov. 29. (12-20-43)

•

• MPR 29-Amend. 1—Increases by-product foundry coke by 30c. per net ton f.o.b. oven plant when produced in Alabama, Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Tennessee, Wisconsin and that part of Ohio west of a line running north and south through a point immediately west of Cleveland. Effective Dec. 20. (12-20-43)

•

• MPR-236—Revised order returns individual boiler repair parts to MPR-188 when sold by manufacturers, to GMPR when sold by jobbers and to MPR-251 when sold installed. Effective Nov. 27. (12-21-43)

•

• PR-3-Amend. 1-7—Provides that blanket MRO ratings may not be applied to get articles on List B except as permitted by the list and adds items to the list. (12-20-43)

Priority Changes

L-7-c—Sched. VI establishes domestic ice refrigerator production quotas totaling 269,809 units for the first quarter of 1944. (12-17-43)

•

L-106—Amended order lifts all restrictions on the use of copper in the 1944 truck program. Restrictions maintained in parts production. (12-20-43)

•

L-128—Amended order lifts all restrictions on the use of chromium and nickel in the manufacture of valves for the new engines that will go into the expanded 1944 truck production program. (12-17-43)

•

L-211—Int. 1 of Sched. 15 designates the bars to which the limitations of the order apply. (12-20-43)

•

L-236—Sched. IV simplifies and standardizes wood and metal tackle blocks. Effective Jan. 21, 1944. (12-21-43)

•

L-314—Amended order lifts all restrictions on the use of copper and copper base alloys in the production of lubrication equipment. Postpones restrictions on number of models permitted for this equipment. (12-20-43)

•

M-1-d-Dir. 1 restricts the flow of certain high zinc alloy aluminum scrap to specified processors. (12-20-43)

•

M-17—Amended order removes pig iron from allocation effective Feb. 1, 1944; eliminates consumers' reports; retains producers' reports. (12-21-43)

•

M-49—Amended order exempts persons using five oz. or less of iridium per month from the need to secure allocation authorization. (12-17-43)


P&H
One post-war problem we've already answered
We're set for whatever comes — now or after the war—with efficient materials handling facilities throughout our plant. Today, *speed* counts most in meeting our wartime schedules. Tomorrow, *lower costs* will stand us in good stead in a competitive market.
The dependability and long life of P&H Electric Cranes answer *this* problem for us.
P&H is America's largest and only crane builder producing complete electrical crane equipment.
General Offices: 4401 West National Ave., Milwaukee, Wis.
HARNISCHFEGER CORPORATION
HOISTS · WELDING ELECTRODES · MOTORS P&H EXCAVATORS · ELECTRIC CRANES · ARC WELDERS
P&H
OVERHEAD CRANES

. . . News in Brief . . .

• Boston reports that bankruptcy among shipyard workers continues. Court officials say that in 95 out of a 100 cases bankrupts are former WPA workers, who while on aid assumed bad debts, and that creditors are just catching up with some of them. A pronounced increase in the number of such bankruptcies is anticipated after the turn of the year when final payments on 1942 taxes are due.

•

• The St. Louis, Mo., plant of Chevrolet Motor Div. is now in production on an amphibious truck, similar to the "duck," produced by General Motors Truck and Coach Div. Output began early in December. Chevrolet plants in Bay City, Saginaw, Flint, Detroit, Toledo and Indianapolis also contribute to this assembly. The St. Louis plant will continue to assemble 6 x 6 trucks, as has been made during the past two years as participation in the 2½-ton truck program of GMC.

•

• A low rate of absenteeism, 2.70 per cent of the total man hours scheduled, has been a contributing factor in setting production records at the Carnegie-Illinois Steel Corp., a U. S. Steel subsidiary. This is an overall figure based on the past 16 bi-monthly pay periods and includes absences due to unavoidable physical incapacity.

•

• *How long does a war worker have to work to earn his salt? New York executive William J. Brown says at least three months for shop personnel and six months for office workers. Brown is secretary-treasurer of the Irving Subway Grating Co.*

•

• In the past nine months, the Baldwin Locomotive Works of Philadelphia put into use, in its various divisions, about 300 prize winning "Production for Victory" suggestions made by employees. More than $8,700 had been awarded in the first six months.

•

• Here is a hot one on Secretary Ickes. Arriving in Boston recently on a very cold day, he was required to walk from Back Bay Station to the hotel. When he arrived he was about frozen and immediately went on record as saying New England needed a lot of heating oil and coal and that he would personally see that New England got it.

•

• Seeking a new source of carbon suitable for making the electrodes required in the production of aluminum, Bureau of Mines chemists have found that mineral impurities in three low-ash domestic coals may be reduced sufficiently by float-and-sink and acid-leaching processes to yield a coke of the desired quality.

•

• Aiming to provide workers with some degree of freedom in selecting their jobs, the Buffalo-Niagara Area Manpower Committee has adopted a resolution permitting applicants at the U. S. Employment Service to choose their spots from the top firms on the labor priorities list. Names of firms most urgently needing help will be displayed on a blackboard at the USES office. This is the first move to pacify choosy workers and get them into the plants since controlled hiring began.

•

• Mechanized warfare has focused attention upon the problem of vibrations and resulted in engineering advances which will greatly affect post-war manufacture, in the opinion of Howard Dodge, general manager of the mechanical goods division of the General Tire & Rubber Co., who has been called upon to aid in the solution of many problems of vibration in military equipment. Heavy, rapid fire guns have been shot so fast that the sights have vibrated to a point where accuracy is impossible. The portable generators used in operation of a searchlight cause tremendous vibration, wearing out the filaments and making it difficult to keep the light on the target. To make anti-aircraft guns accurate, the recoil must be absorbed. The vacillation of tank engines must be reduced to the minimum to increase accuracy of fire. Helping solve matters, he says, is "Silentbloc," a method of vibration absorbtion which uses rubber and steel.

•

• The Pittsburgh Plate Glass Co., Pittsburgh, does not anticipate lengthy reconversion of its plants in the post-war period, according to R. L. Clause, president. Much of its present activity is devoted to war work, but the basic equipment for production is the same in war as in peace, although the quality or type may be special. Therefore, there will be no delay in the manufacture and supplying of civilian goods.

•

• Requirements for industrial thermometers in 1944 will equal 1943 production and may exceed it by about 25 per cent, the industrial thermometer industry advisory committee was told at its meeting in Washington, the War Production Board announced recently. Shipbuilding uses between 80 and 90 per cent of current industrial thermometer production.

•

• The Dayton Rubber Mfg. Co., Dayton, Ohio, has just received the 1943 award for chemical engineering achievement, in recognition of its outstanding contribution to the design, construction and operation of the American synthetic rubber program. The Copolymer Corp., Baton Rouge, La., received a like award.

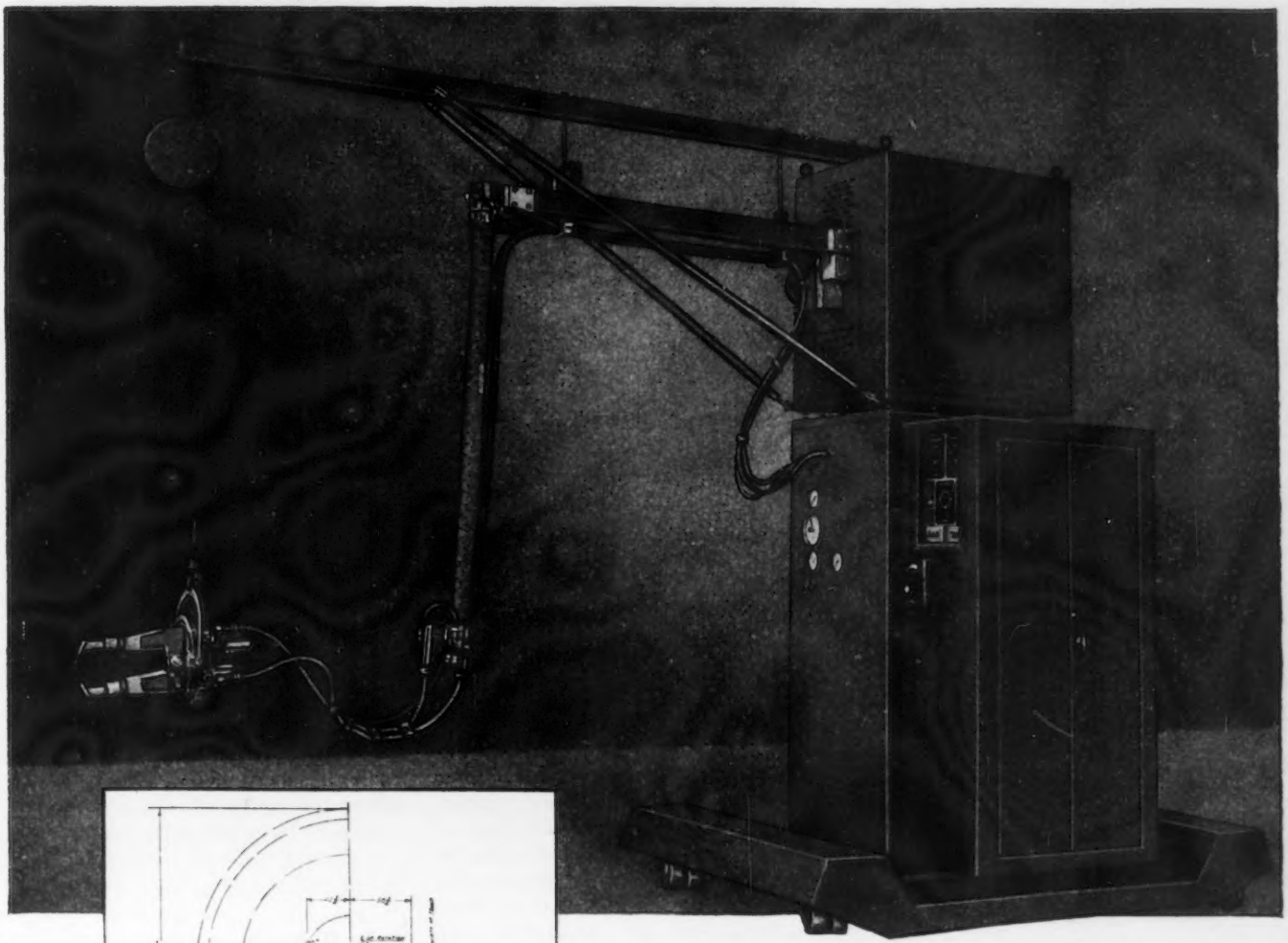
•

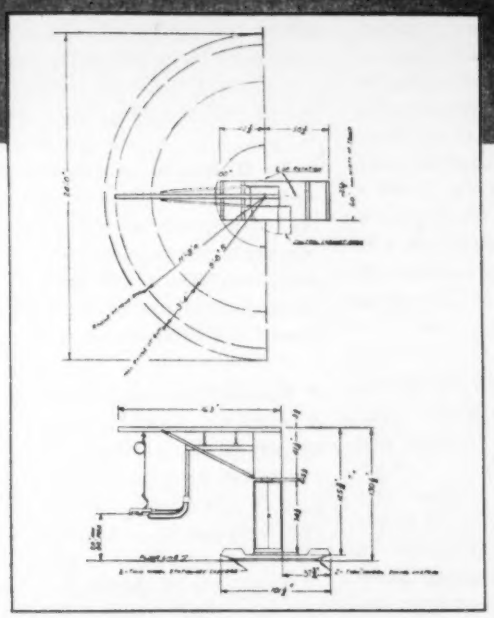
• Cans, Inc., Chicago, reports its 1942 business has now been renegotiated, and no refunds are due the government. R. S. Solinsky, president, attributes this to a company policy of civilian cost procedure on war items, less selling expense.

•

• Acme Steel Co., Chicago, is completing a contract for which it has been hot and cold rolling gilding metal part time on its 16-in. steel strip mill. The mill is used the balance of the time for steel production.

HELPING TO SOLVE TODAY'S WARTIME PRODUCTION PROBLEMS





Dimension drawing of Sciaky Type PS2R-1, 100 KW, Radial Portable Spot Welder, showing maximum reach of gun and 180° rotation. Capacity: Aluminum and light alloys in two thicknesses of .016" minimum up to and including .064"—corrosion resisting steels up to two thicknesses of .080".

it reaches your welding problems

This radial portable spot welder for aluminum and light alloys will fill a long felt need in the fabrication of light structures. Sciaky engineering now makes it possible to bring the advantages of aluminum spot welding *to the assembly.* Crowded and fixed jigs can be easily reached. Tacking operations as well as structural welding can be accomplished with greater speed and efficiency.

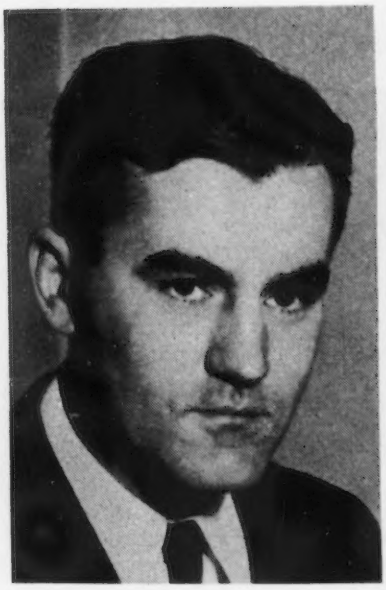
Stored Energy with Preheating and Variable Pressure, features which are established as superior in the welding of aluminum, are employed. The control cabinet, main welding reactor, monorail and special copper bars connecting the gun to cables are all built as a self contained unit. This unit is mounted on a stationary column and pivots on a vertical axis by means of ball bearings mounted inside the column. Transversal movement of the gun on a straight line can be 12 feet in length. The gun may also be moved vertically 20 inches above and below a minimum position.

SCIAKY BROS.

Manufacturers of a Complete Line of
A.C and D.C Electric Resistance Welding Machines
4915 W. 67th Street, Chicago, 38, Illinois

PERSONALS

W. F. DIETRICHSON, general mechanical engineer, American Car & Foundry Co.



JOHN E. ANGLE, assistant general superintendent, Carnegie-Illinois Steel Corp.

• **Paul Reeves** has been named advertising manager of Timken Roller Bearing Co., Canton, Ohio, to succeed **Roland P. Kelley** who has occupied that position for the last 17 years and who has resigned to go into advertising agency work. Mr. Reeves joined the Timken company in 1929 where he served as sales engineer in the Chicago office of the company. He was subsequently transferred to the Pacific coast where he was made industrial district manager of the company's San Francisco Branch. In 1940 he was brought back to the home office in Canton as sales promotion manager, but when this country entered the war, he was put in charge of government priorities to handle contacts between the company and Washington.

• **F. L. Meacham** has been appointed manager of sales and service of the Chicago Vitreous Enamel Products Co., Cicero, Ill. Mr. Meacham was formerly research chemist and metallurgical assistant at the American Rolling Mill Co., Middletown, Ohio, during which time he pioneered and developed sheet metal for the application of porcelain enamel. He joined the sales and service division of Chicago Vitreous Enamel Product Co. Nov. 16, 1943.

• **Bruce Price** formerly with the Landis Tool Co., Waynesboro, Pa., has become associated with Stedfast & Roulston, Inc., Boston, and will handle the sale of machine tools in Rhode Island, Eastern Connecticut, and Southeastern Massachusetts.

• **Harry B. Higgins,** executive vice-president, has been elected president of Pittsburgh Plate Glass Co., Pittsburgh. Other executive changes, all effective Jan. 1, are: **Clarence M. Brown,** resigning as chairman of the board, will remain active as a member of the executive committee and as chairman of the finance committee. **Harry S. Wherrett,** now vice-chairman of the board, will become chairman of the board. **Robert L. Clause,** now president of the company, will be vice-chairman of the board.

• **Samuel D. Lunt** managing partner of Hamlin & Lunt, Buffalo, stock brokers, has been elected a member of the board of directors of Wickwire Spencer Steel Co., New York.

• **W. F. Dietrichson,** formerly assistant general mechanical engineer of American Car & Foundry Co.'s Berwick plant, has been made general mechanical engineer. He first worked as a draftsman for Standard Steel Car Co. after which time he left to join the A.C.F. St. Louis general mechanical engineering office, working as checker and calculator. Following the war, he re-entered the engineering department of American Car & Foundry Co. as assistant mechanical engineer at the St. Louis plant. In 1938, Mr. Dietrichson was appointed assistant general mechanical engineer with headquarters in Berwick, Pa., in which capacity he has served until his present promotion.

• **William H. Lang** and **Wallace Diffenderfer** have been appointed assistant credit managers for Eastern and Central areas, respectively of Carnegie-Illinois Steel Corp. Formerly a credit representative, Mr. Lang joined the corporation as a statistician in 1933. Mr. Diffenderfer, whose association began in 1938 as analyst became assistant manager of the market research bureau in 1940, and in 1941 became the treasury department credit representative.

• **Palmer Nicholls** has been elected vice-president of Bendix Aviation Corp. and also appointed general manager of the newly created Pacific division of the corporation. The Pacific division succeeds the former wholly-owned subsidiary, Bendix Aviation, Ltd., at North Hollywood, Cal., of which Mr. Nicholls was president and general manager.

• **John E. Angle** has been appointed assistant general superintendent of the Gary sheet and tin in mill of Carnegie-Illinois Steel Corp., succeeding **C. A. Ferguson,** recently promoted to general superintendent. Mr. Angle joined the company as junior metallurgist at Gary following his graduation from Lehigh University in 1932, and in 1935 became chief metallurgist.

• **E. B. Farris,** formerly connected with Edgar T. Ward Sons Co., Cleveland, Ohio, was recently appointed to represent the steel division of Copperweld Steel Co. of Warren, Ohio. His headquarters are in the Cleveland office of the company.

• **Robert Murray** of American Steel & Wire Co., New Haven, Conn., subsidiary of U. S. Steel Corp. has been appointed assistant division metallurgist in Cleveland. **Edwin E. Caspell** has been named superintendent of the New Haven Works succeeding Mr. Murray, while **Arvin P. Wiedemann** has been made general foreman of the rope mill at New Haven, replacing Mr. Caspell. Mr. Murray has been with American Steel & Wire Co. since 1920. He was named assistant superintendent of the New Haven works in 1938 and superintendent in 1941 which post he has held to the present time. Mr. Caspell has held various positions with the company since his entry in 1932, and in 1938 was made general foreman of the rope mill at New Haven. Mr. Wiedemann started his services in 1937 and since 1940 has been assistant general foreman of the rope mill also at New Haven.

ALLEN W. CLARKE, assistant general mechanical engineer, American Car & Foundry Co.

JOHN W. DENNISTON, supervisor of the Chicago sales office of L. & R. Manufacturing Co., Arlington, N. J.

RALPH P. DEPUTY, division superintendent, Carnegie - Illinois Steel Corp.

• **Allen W. Clarke,** formerly mechanical engineer in charge of the western engineering division of American Car & Foundry Co., has been appointed assistant general mechanical engineer with headquarters at St. Charles, Mo.

He began his employment with American Car & Foundry Co. in 1905. During the years he has been associated with American Car & Foundry Co., Mr. Clarke served in the engineering department at the Jeffersonville, Ind., plant where he later became chief draftsman and subsequently local engineer. In 1932 he transferred to the engineering department at the Berwick plant, remaining there until September, 1933, when he was placed in charge of the western engineering division with offices at St. Charles, Mo.

• **E. C. Ostlund** has been appointed assistant chief industrial engineer of the American Steel & Wire Co., U. S. Steel subsidiary, with offices in Cleveland. At the same time, **Evarts C. Hall** has been named works industrial engineer at South Works, Worcester, Mass., to succeed Mr. Ostlund. Mr. Ostlund has been associated with the American Steel & Wire Co. since October, 1936, when he was made an industrial engineer in the Worcester district manager's office. Since November, 1940, has been works industrial engineer at South Works. Mr. Hall first started working for the company in November, 1936, in the Worcester district industrial engineering department. He has been works industrial engineer at North Works, Worcester, since December, 1942.

• **John J. Donahue,** production engineer fuel cell department United States Rubber Co., Detroit, has been transferred to the company's Fisk Tire, Chicopee Falls, Mass., plant in charge of tire production. A native of Providence, Mr. Donahue started with the company in 1915.

• **Edward H. Fitch** has been named merchandise manager of the combined automotive, aviation and government sales divisions of B. F. Goodrich Co. Mr. Fitch joined the company in 1931, and after serving nine years in the credit and sales departments of the replacement tire division, he was transferred to his present division on special assignments in 1940 and has been division operations manager since May 1, 1942.

• **Albert J. Hess,** manager of the cold rolled strip and springs department of the Chicago office of American Steel & Wire Co., has retired after 53 years' service in the steel industry.

• **John W. Denniston** has been made supervisor of the Chicago sales office of L & R Manufacturing Co., Arlington, N. J. Mr. Denniston was formerly in charge of sales for the New England area. He has been with L & R for several years and has a splendid background of experience in precision cleaning of small, highly vulnerable parts.

• **Louis H. Young** has been made vice-president of the Gillette Safety Razor Co. He has been consulting physicist since 1927 and joined the organization as works manager in 1937. Formerly he was a professor at M.I.T.

• **Ralph P. Deputy** has been named division superintendent of the sheet mill of Carnegie-Illinois Steel Corp. succeeding **Mr. Angle.** Mr. Deputy started his service with the United States Steel Corp. subsidiary in October, 1912, at Gary. After a year's service with Columbia Steel Co., at Torrance, Cal., he returned to Gary in 1933 as sheet mill finishing department superintendent, the position he has held until the present promotion.

OBITUARY...

• **Frank P. Miller,** president and treasurer of McCrosky Tool Corp., Meadville, Pa., died suddenly of heart attack on Dec. 11. Mr. Miller had been actively associated with McCrosky Tool Corp. for 36 years.

• **M. T. Mortensen** of the Detroit sales office of American Foundry Equipment Co., Mishawaka, Ind., died Dec. 15. He joined the company early in 1940.

• **David B. Piersen,** chairman of the board of directors of Stephens-Adamson Mfg. Co., Aurora, Ill., died on Nov. 29 at the age of 63.

• **William G. Irwin,** nationally prominent industrialist, financier and philanthropist and one of the key figures in the development of this country's diesel engine industry, died suddenly Dec. 14 in Indianapolis.

MACHINE TOOLS

Murray Urges Excess Tool Distribution

Washington

• • • **Senator Murray** of Montana has introduced a bill providing for the equitable distribution of government-owned surplus machine tools. This bill will implement a movement which WPB has in mind and is intended to meet the recommendations of the Machine Tool Industry Advisory Committee of WPB. Senator Murray's statement said in part:

From 1941-1943 inclusive not less than 700,000 machine tools were produced in this country compared with 250,000 produced during the 10 years ending 1939. Stated in dollar terms, our machine tool output totalling more than $3,000,000,000 for 1941-1943 inclusive, exceeds our total output for the entire 20 years preceding Pearl Harbor.

Making due allowance for normal peace-time needs, the excess of this expanded supply over the most liberal estimate of current war-time needs, amounts to at least 300,000 tools which are now lying idle in storage or occupying valuable space in the war plants of the country.

The measure which I have just introduced establishes what is no more than a policy-making commission and in no sense a new bureau. It is to be composed of representatives of the War and Navy Departments, the Maritime Commission and the Defense Plant Corp., besides five additional members representing the industries concerned and the public-at-large. Existing government personnel and facilities are to be used to the utmost extent feasible, and the employment of additional personnel avoided wherever possible.

Procedures are provided for determining what tools are surplus and the standards for their classification prescribed. After reserving a sufficient supply of tools for all government needs, current and future, the remainder under appropriate terms and conditions are to be allocated for the maintenance and establishment of small metal working concerns generally and in particular to aid in setting up war veterans in metal working enterprise. Government loans and advances are provided for these purposes.

Provision is also made for permitting the schools and colleges of the country to avail themselves of these machine tools. The residue is to be available for export in foreign trade subject to license by the Secretary of State in each instance in accordance with the requirements of our foreign policy. The life of the Act is limited to three years following the termination of hostilities, after which any tools then remaining on hand are to be sold as broken scrap.

o o o

Quick Contract Cancellation Urged

Cleveland

• • • **In the December, 1943,** issue of *Machine Tools*, published by the National Machine Tool Builders Association, there is discussed the need for legislation covering the cancellation of war contracts. The necessity for clearing out a lot of hangover material from war work at the close of the war makes vitally important two phases that should be covered by such legislation when enacted. First, cancellations charges must be paid the manufacturer quickly so that funds are available for reconversion, and second quick disposal of raw materials and inventory must be made so that plants have shop room to make such reconversions.

In the case of prime contractors, this could be done within a reasonable period of time, but with many subcontractors that are away down the line, the time lapse between cancellation and clearing up of the work is a serious factor.

Every company, prime or subcontractor, involved in manufacturing war goods today must go through a complex sequence of steps to get a cancelled contract cleared up. The company must get cancellation charges from its sources and their sources, and have them sworn to by responsible officers of the companies involved. Then a compilation of charges must be submitted to the customer, who combines these charges with other charges to present its claim in turn. Following conferences between the prime contractor and government negotiators, accounting, financial and legal offices, the claim, if approved, goes to the board of review in the office of the government contracting officer for approval.

In the meantime, however, every company in the sequence is pleading for permission to dispose of material and parts involved. Furthermore, different government departments have different cancellation procedures.

To overcome these difficulties, the National Machine Tool Builders Association suggests legislation incorporating the following general principles:

1. Standardization of all contract cancellation terms.

2. Quick settlement negotiation.

3. Provisions for settlement of all cancellation claims by one agency.

4. Provisions for immediate cash settlement equal to at least 75 per cent of the estimated value of cancellation claims.

5. Provisions for immediate disposal of work involved, either by channeling material into peacetime production or scrapping.

o o o

Tool Shipments Drop in November

Washington

• • • **Machine tool** shipments in November totaled $71,543,000, a decline of about 8½ per cent from the $78,312,000 October total, the Tools Division of the WPB announced last week.

Total firm orders received in November were valued at $37,705,000, an increase of 8 per cent over the $34,907,000 October total. Cancellations were $5,979,000, as compared with the October cancellations of $4,071,000.

Net new orders for November (total orders less cancellations) totaled $31,726,000 compared with $30,836,000 in October.

"Coming in on a Wing... and some great instruments"

. . . aided by work well-done by These Men of the Cutting Tool Industry

It happens every day. Roaring through dirty weather, his ship peppered with bullets and shells, a plucky American pilot coasts safely into his home base. Good flying and *good instruments!*

The mass-production of good instruments for America's gigantic air forces—as well as all branches of the armed services—brought forth plenty of problems of special seriousness to the cutting tool industry.

For example, the mass-production of certain types of aviation instruments, shell fuses, time fuses and other materiel demanded the creation and big-volume output of fine pitch hobs—of an accuracy and fineness that would have been termed impossible just a few years ago.

Typical of the way problems like that were solved is shown in the on-the-job meeting of the cutting tool field engineers pictured above. And in the face of many other obstacles (manpower shortages and material scarcities, for instance) equally tough problems were dispatched with similar skill and efficiency.

When victory is won, war-proved Barber-Colman engineering will then be working to help solve peacetime production problems. When that great day comes, we'll be glad to be of service to you!

Barber-Colman Company

GENERAL OFFICES AND PLANT • 204 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

Complete Cutting Tool Service • Engineering • Manufacturing

Hobs • Milling Cutters • Reamers • Special Tools • Sharpening Machines

NON-FERROUS METALS

. . . News and Market Activities

Zinc Smelter Output Data Released

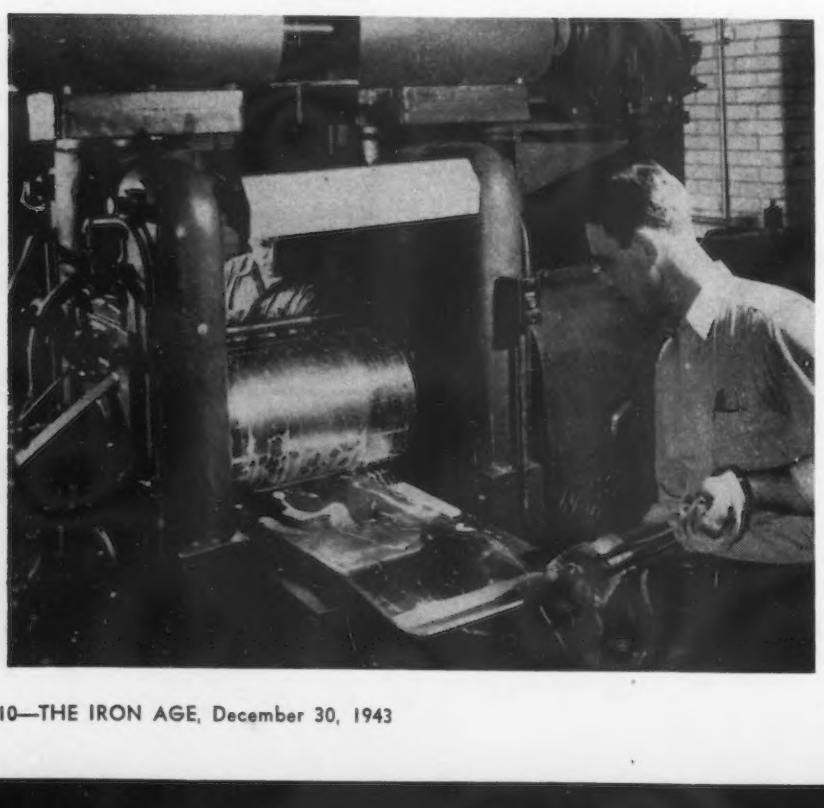
TOTAL SLAB ZINC SMELTER OUTPUT (ALL GRADES) 1942-1943, NET TONS

				Shipments					
1942	Stock at Beginning	Production	Total	Domestic	Export & Drawback	Total	Stock End of Period	Unfilled Orders End of Period	Daily Average Production
January	24,066	79,417	103,483	67,382	12,166	79,548	23,935	110,552	2,562
February	23,935	73,579	97,514	60,070	14,818	74,888	22,626	109,260	2,628
March	22,626	79,187	101,813	61,612	18,499	80,111	21,702	103,297	2,554
April	21,702	77,170	98,872	63,955	12,358	76,313	22,559	98,885	2,572
May	22,559	79,545	102,104	67,311	16,346	83,657	18,447	84,809	2,566
June	18,447	75,124	93,571	56,892	9,125	66,017	27,554	80,104	2,504
July	27,554	76,441	103,995	59,250	12,159	71,409	32,586	65,518	2,486
August	32,586	77,002	109,588	57,822	15,114	72,936	36,652	58,972	2,484
September	36,652	74,285	110,937	51,461	9,429	60,890	50,047	49,289	2,476
October	50,047	77,990	128,037	61,263	11,369	72,632	55,405	46,082	2,516
November	55,405	77,171	132,576	57,481	9,846	67,327	65,249	45,989	2,572
December	65,249	82,859	148,108	69,419	10,421	79,840	68,268	52,752	2,673
Totals	.....	929,770	.....	733,918	151,650	885,568	.....	.....	.....
Monthly Average	.....	77,481	.....	61,160	12,637	73,797	Daily Average	.....	2,547
1943									
January	68,268	83,870	152,138	45,735	10,296	56,031	96,107	69,426	2,705
February	96,107	76,667	172,774	66,552	8,210	74,762	98,012	66,920	2,738
March	98,012	83,787	181,799	66,111	9,922	76,033	105,766	62,879	2,703
April	105,766	81,057	186,823	73,131	5,650	78,781	108,042	60,260	2,702
May	108,042	82,399	190,441	75,225	4,201	79,426	111,015	60,212	2,658
June	111,015	78,865	189,880	68,271	5,920	74,191	115,689	57,879	2,629
July	115,689	80,249	195,938	67,549	3,229	70,778	125,160	51,819	2,589
August	125,160	79,736	204,896	68,953	2,857	71,810	133,086	49,617	2,572
September	133,086	79,361	212,447	68,180	980	69,160	143,287	49,147	2,645
October	143,287	83,066	226,353	69,845	2,101	71,946	154,407	41,532	2,680
November	154,407	80,579	234,986	73,364	1,769	75,133	159,853	42,151	2,686

Commencing with 1940, production from foreign ores is included in this report which reflects the total output of slab zinc of all grades, as reported by all producers represented in American Zinc Institute.

• • • **Lifting of the ban** on production statistics has resulted in the release of zinc smelter output for the period during censorship. Peak production month was January, 1943, when 83,870 tons were smelted. March of this year was second with 83,787 tons and October third with 83,066 tons. In 1942, December was first with 82,859 tons produced May second with 79,545 tons and March third with 79,187 tons.

ALCOA RESEARCH: *Rolling an experimental aluminum alloy ingot into sheet on the laboratory hot rolling mill.*



Stock at the end of November amounted to 159,853 tons, highest for the past 15 years.

•

Tin Alloy Al Scrap Restricted

• • • **To protect the aluminum** supply from contamination, WPB has issued Direction 1 to Supplementary Order M-1-d, as amended, restricting the flow of certain high zinc alloy aluminum scrap.

The direction provides that until Dec. 31, 1943, the alloy scrap may be sold only to dealers and the following producers and smelters: Aluminum Co. of America; National Smelting Co.; Aluminum & Magnesium, Inc.; Samuel Greenfield Co., Inc.

After December 31, 1943, the alloy scrap may be sold only to dealers and the following companies: Aluminum Co. of America; National Smelting Co. Only these two companies are willing to handle this type of scrap.

•

Scrap and Secondary Al Ingots Reduced

• • • **Ceilings on aluminum scrap** and secondary aluminum ingot at the producer level were reduced 1.5c. a lb. Basic price now for secondary ingot is 12.5c. a lb. This price reduction follows current market conditions since these products have for some time been selling at below ceiling price.

This action has been taken to assure purchasers a reasonable price differential between secondary and primary metal. As primary aluminum production increased and surpassed demand, secondary ingot could not compete favorably with the primary metal.

With the 1.5c. a lb. price reduction for scrap, high grade segregated solids will have a ceiling of 8.5c. a lb. in carload lots and high grade segregated borings and turnings 7c. a lb. in carload lots.

Primary grade ingot has been lowered only 0.5c. a lb.

•

Antimony Metal and Compounds

• • • **Under Maximum Price** Regulation 497, antimony metal and antimony compounds, issued Dec. 3, 1943, imported antimony metal and domestic antimony metal have the same maximum prices. The maximum prices are determined according to the grades of antimony metal without reference to the place at which it was produced.

REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	13.50
Aluminum, deoxidizing grades	12.50 to 13.75
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5-5 ingots (No. 115)	12.25
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be	$15.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$10.00
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	21.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	$191 to $193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.87
Copper, H.R.	....	17.37	....
Copper, drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	.

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper: 2000-lb. base. 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

Copper, Copper Base Alloys

OPA Group 1

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	8.00
Old rolled brass	7.75
Admiralty condenser tubes	8.00
Muntz metal condenser tubes	7.50
Plated brass sheet, pipe reflectors	7.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4

Automobile radiators	7.00

OPA Group 5

Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Aluminum

Plant scrap, segregated

2S solids	9.00
All other solids	8.50
Borings and turnings	
W'rt alloys (17S, 18S, 32S, 52S)	7.50
High grade alloys	7.00
Low grade alloys	6.50

Plant scrap, mixed

All solids	7.50
Borings and turnings	5.50

Obsolete scrap

Pure cable	9.00
Old sheet and utensils	7.50
Old castings and forgings	8.00
Pistons, free of struts	8.00
Pistons, with struts	6.00
Old alloy sheet	7.00

For old castings and forgings, pistons, sheets, add ½c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1½c. a lb.

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	8.00

Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

New zinc clippings, trimmings	7.25
Engravers', lithographers' plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.80
Die cast slab	5.80
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00–13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82–41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

SCRAP

. . . News and Market Activities

Recent OPA Interpretations Digested

New York

• • • **In a new set of scrap** price interpretations OPA says that if a car arrives invoiced as a particular grade but turns out to be half of one grade and half another, the maximum price is for the inferior grade even though the poorer grade was not accepted. The car is considered a "mixed shipment."

Scrap originating from a railroad and stored in the yard of a dealer is considered to have lost its railroad origin and may not be priced as such. This does not apply to railroad scrap to be prepared in transit.

Billet and bloom crops containing 0.10 Phos and under, and 0.05 S, conforming to specifications for item 13 of the schedule, when sold for basic electric furnace use direct from the producer may demand a premium of $2.50 per gross ton over No. 1 heavy melting.

When turnings contain excessive oil (oil which will not adhere to the turnings) the weight of the excessive oil must be deducted from the total weight before determining the price of the shipment.

In all-truck shipments of scrap when the load is picked up at several points the last point of loading is considered to be the shipping point.

A broker in order to qualify for brokerage commissions must not only sell at the same price at which he purchases but must also pass along any discounts earned through prompt payment of invoices.

A broker corporation which own 50 per cent of the stock in a subsidiary corporation may not accept brokerage commissions on sales of scrap purchased from the subsidiary on the basis of having a "substantial financial interest."

Malleable iron borings are an unlisted grade which must be priced at $4.00 per gross ton below No. 1 heavy melting.

Loose used tin cans when sold for any price other than copper precipitation are classified as unprepared scrap and must be priced at $3.50 per gross ton below tin can bundles.

•

CINCINNATI—With a reported lifting of pig iron allocations, an easing in the cast scrap market is anticipated. With reported cut-backs in the steel production, the supply of steel scrap is reported to be in fair quantity and some dealers indicate that steel grades are in ample supply, but that the emphasis must now be placed upon preparing for possible contingencies, the outstanding of which, of course, at the present time, is the threatened railroad strike. At the same time, mills are reported accepting moderate amounts of scrap to maintain inventories, while at the same time the foundries, as a result of the release of pig iron allocations, tend to ease pressure for cast scrap.

•

ST. LOUIS—The usual holiday quiet prevails in the St. Louis scrap market. Inventory situation of the mills is improved as a result of receipts of remote scrap, but with increasing cold weather and prospects for snow the nearby situation gives little promise of increasing receipts. Seventy men with 20 trucks working in southeast Missouri in the Army's drive gathered only 30 tons in December.

•

NEW YORK—Scrap picture this week is very quiet. Three of the five eastern Pennsylvania mills are out of the market this week. Scrap supply at the mills appear more than adequate. Only grades moving freely are blast furnace scrap and cast which, of course, is limited in supply.

•

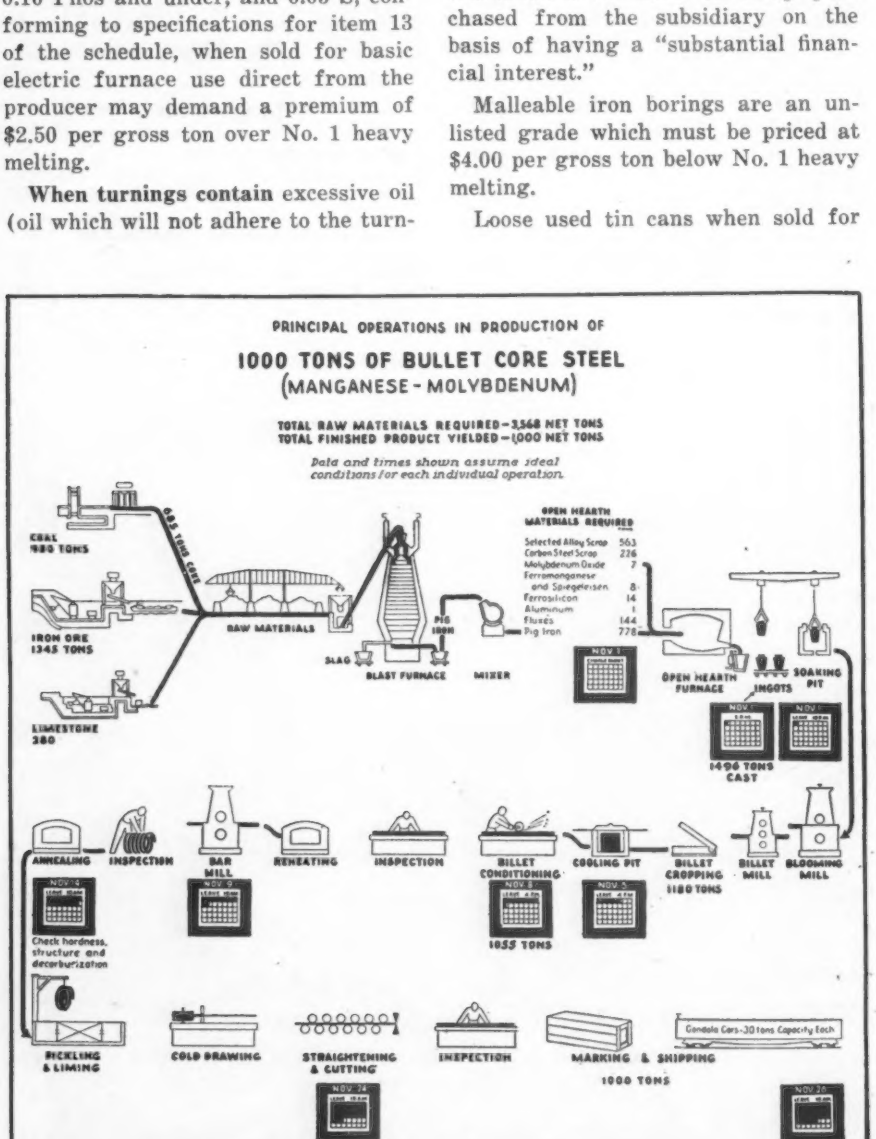
BOSTON—Between cold weather and yardmen taking time out to celebrate Christmas, business was as near a standstill as possible the past week, and indications are the pre-New Year's week will be equally quiet. As the year draws to a close no change is noted in opinions held by yards and brokers regarding future business. No increase in the supply of labor or available scrap is anticipated, and 1944 is already marked as one of the quietest years on record.

•

PHILADELPHIA—Scrap business has dropped sharply. Several mills have curtailed shipments. One mill in this district has placed an embargo on all grades but blast furnace scrap. Some alloy scrap, both solids and turnings, have been sold with premiums and springboard eliminated. This tonnage is relatively small and has made little dent in the alloy scrap pile. Action from Washington on the alloy scrap problem is expected very soon, probably after the New Year.

•

BUFFALO—Scrap activities were at an extreme low level this week, operators devoting most of their time to taking inventories. A virtual embargo on open hearth and blast furnace items remained in force. Leading consumers were in the market only for extra choice items.



IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES									
							Low Phos.		Heavy Structural and Plate			Foundry Steel				
	No. 1 & 2 Hvy. Melt. No. 1 Cp. Blk. Shts. No. 1 & 2 Bundles No. 1 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Billet, Bloom, Forge Crops	Bar Crops, Punchings Plate Scrap and Cast Steel	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crankshafts	Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle and Forge Turn. First Cut	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$15.00	$15.00	$16.00	$17.00	$17.50	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$21.00
Cleveland, Middletown, Cincinnati, Portsmouth	19.50	14.50	14.50	15.00	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75
Ashland, Ky.	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50
Buffalo, N. Y.	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25
Bethlehem, Pa.; Kokomo, Ind.	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25
Duluth, Minn.	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00
Detroit, Mich.	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85
Toledo, Ohio	.....	12.85	12.85	13.85	14.85	15.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis, Mo.	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles; Pittsburg, Cal.; San Francisco	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00
Minnequa, Colo.	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50
Seattle, Wash.	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.00	15.00	12.50	14.00	15.50

* Baled turnings are $5 per gross ton higher.

BUNDLES: Tin can bundles are $4 below dealers' No. 2 bundles; No. 3 bundles are $2 less than No. 1 heavy melting.

AT NEW YORK CITY or Brooklyn, the maximum shipping point price is $15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on truck. Minimum set at $14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is $15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of $6.66 per ton.

SWITCHING CHARGES: Deductions for shipping points within basing points (cents per gross ton) are: Pittsburgh, Brackenridge, 55c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, 42c.; Butler, Monessen, Canton, Steubenville, Cincinnati*, Portsmouth, Ashland, Coatesville, Harrisburg, Phoenixville, Bethlehem, Kokomo, Duluth, St. Louis, 28c.; Buffalo, Claymont, 36c.; Conshohocken, 11c.; Atlanta, Birmingham, 32c.; Pittsburg, Cal., 42c.; Middletown, 14c.; Sparrow's Point, 11c.; Chicago, 84c.; Detroit, 53c.; Alabama City, 26c.; Minnequa, 22c.; Seattle, 38c. At Cincinnati, for basic open hearth grades, foundry steel and auto springs and crankshafts, deduct 80c. per ton.

PITTSBURGH basing point includes switching districts of Bessemer, Homestead, Duquesne, Munhall and McKeesport. Cincinnati basing point includes Newport, Ky., switching district. St. Louis includes switching districts of Granite City, East St. Louis, Madison, Ill. San Francisco includes switching districts of S. San Francisco, Niles and Oakmont, Cal. Claymont, Del., includes the switching point of Chester, Pa. Chicago includes Gary, Ind., switching district.

MAXIMUM SHIPPING POINT PRICE—Where shipment is by rail or vessel, or by combination of rail and vessel, the scrap is at its shipping point when placed f.o.b. railroad or f.a.s. vessel. In such cases, the maximum shipping point prices shall be: (a) For shipping points located within a basing point, the price listed in the table above for the scrap at the basing point in which the shipping point is located, minus the lowest established switching charge for scrap within the basing point and (b) for shipping points located outside the basing point, the price in table above at the most favorable basing point minus the lowest transportation charge by rail or water or combination thereof. In lieu of dock charge add 75c. a ton, but 50c. if moved by deck scow or railroad lighter. Shipping by motor vehicle: The scrap is at its shipping point when loaded. For shipping points located within basing points take price listed in table minus applicable switching charge. If located outside a basing point, the price at the most favorable basing point minus lowest established charge for transporting by common carrier. If no established transportation rate exists, the customary costs are deducted. Published dock charges prevail. If unpublished include 75c.; at Memphis, 50c.; Great Lakes ports, $1; New England, $1.25. For exceptions see official order.

UNPREPARED SCRAP: For unprepared scrap, maximum prices shall be $3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made $4) less maximum prices for the corresponding grade or grades of prepared scrap. In no case, however, shall electric furnace and foundry grades be used as the "corresponding grade or grades of prepared scrap." Converter may charge $2.50 per ton on consumer-owned unprepared remote scrap (see order). A preparation-in-transit charge for allocated unprepared scrap is provided.

NEW LISTED GRADES: Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced—$2; 75 to 85% Fe—$4; under 75% Fe—$8 per ton. Mill scale of 65% or more Fe—$8 per ton. Mill cinder and grindings, shipping point maximum price of $4 per gross ton at all U. S. shipping points.

CHEMICAL BORINGS: No. 1 (new, clean, containing not more than 1 per cent oil), $1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5 per cent oil), $2 less than No. 1 heavy melting. If loaded in box cars add 75c.

RAILROAD SCRAP

	No. 1 RR Heavy Melting	Scrap Rails	Rails for Rerolling	Scrap Rails 3 ft. and Under	Scrap Rails 2 ft. and Under	Scrap Rails 18 in. and Under
Cleveland, Cincinnati Ashland, Portsmouth, Middletown	$20.50	$21.50	$23.00	$23.50	$23.75	$24.00
Canton, Pittsburgh, Sharon, Steubenville, Wheeling, Youngstown	21.00	22.00	23.00	24.00	24.25	24.50
Chicago, Philadelphia Sparrows Pt., Wilmington	19.75	20.75	22.25	22.75	23.00	23.25
Birmingham, Los Angeles, San Francisco	18.00	19.00	20.50	21.00	21.25	21.50
Buffalo	20.25	21.25	22.75	23.25	23.50	23.75
Detroit	18.85	19.85	21.35	21.85	22.10	22.35
Duluth	19.00	20.00	21.50	22.00	22.25	22.50
Kansas City, Mo.	17.00	18.00	19.50	20.00	20.25	20.50
Kokomo, Ind.	19.25	20.25	21.75	22.25	22.50	22.75
Seattle	15.50	16.50	18.00	18.50	18.75	19.00
St. Louis	18.50	19.50	21 00	21.50	21.75	22.00

CAST IRON SCRAP

	Group A	Group B	Group C
No. 1 cupola cast	$18.00	$19.00	$20.00
Clean auto cast	18.00	19.00	20.00
Unstripped motor blocks	15.50	16.50	17.50
Stove Plate	17.00	18.00	19.00
Heavy Breakable Cast	15.50	16.50	17.50
Charging Box Size Cast	17.00	18.00	19.00
Misc. Malleable	20.00	21.00	22.00

Effective Dec. 14, 1943, dealers no longer absorb freight from point of origin to yard for preparation to No. 1 Cupola Cast.

Group A includes the states of Montana, Idaho, Wyoming, Nevada, Utah, Arizona and New Mexico.

Group B includes the states of North Dakota, South Dakota, Nebraska, Colorado, Kansas Oklahoma, Texas and Florida.

Group C: States not named in A and B; switching district of Kansas City, Kan., Mo.

Tool Steel Scrap Ceiling Prices Set by MPR 379, May 4, 1943

BASE PRICE SEGREGATED

	Solids, Lb. Cont. W	Turnings, Lb. Cont. W
Type 1	$1.80	$1.60
Type 2	1.60	1.40
Type 3	1.25	1.25
Type 4*	0.125	0.105
Type 5*	0.135	0.115

*Per lb. of scrap material.

BASE PRICE UNSEGREGATED SOLIDS

$1.50 per lb. contained W if 5% or more.

$1.15 per lb. contained W if over 1% and less than 5%.

$0.80 per lb. contained Mo if 1½% or more.

BASE PRICE UNSEGREGATED TURNINGS

$1.30 per lb. contained W if 5% or more.

$1.00 per lb. contained W if 1% and less than 5%.

$0.70 per lb. contained Mo if 1½% or more

Comparison of Prices . . .

Advance Over Past Week in **Heavy Type**; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	Dec. 28, 1943	Dec. 21, 1943	Nov. 30, 1943	Dec. 29, 1942
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Dec. 28, 1943	Dec. 21, 1943	Nov. 30, 1943	Dec. 29, 1942
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.89	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	23.94	23.94	23.94	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	31.34	31.34	31.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00
Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$6.50	$6.00
Foundry coke, prompt	7.50	7.375	6.875	6.875
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake, New York	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	22.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 109-123.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
Dec. 28, 1943	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, reductions, and in most cases freight absorbed to meet competition. Delivered prices do not reflect new 3 per cent tax on freight rates. GOVERNMENT CEILING—Price Schedule No. 6 issued April 16, 1941, governs steel mill prices; Price Schedule No. 49 governs warehouse prices which are on another page of this issue.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars [b]	Pacific Ports, Cars [10]	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	3.67¢
Long ternes[2]	3.80¢	3.80¢[d]	3.80¢									4.55¢[d]		4.16¢	4.12¢
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢	2.46¢	
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢	3.16¢	
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢							2.56¢	
Commodity C-R	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢	3.31¢	
TIN MILL PRODUCTS															
Coke tin plate, base box	$5.00	$5.00	$5.00						$5.10					5.36¢	5.32¢
.50 / .75 Electro tin plate, box	$4.50	$4.50	$4.50						$4.60						
	$4.65		$4.65						$4.75						
Black plate, 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢[12]			3.37¢
Mfg. ternes, special box	$4.30	$4.30	$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢[13]	2.25¢	2.39¢	
Reinforcing (rail)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢[c]	2.55¢[13]	2.25¢		2.47¢
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)		(Weirton = 2.80¢)		2.99¢		2.97¢
Alloy, hot rolled	2.70¢	2.70¢				2.70¢		(Bethlehem, Massillon, Canton = 2.70¢)					2.80¢		
Alloy, cold drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢		
								(Coatesville and Claymont = 2.10¢)							
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢[a]		2.10¢	2.10¢	2.35¢		2.45¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor plates	3.35¢	3.35¢									3.70¢[c]	4.00¢		3.71¢	3.67¢
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95¢	4.15¢		3.70¢	3.59¢
SHAPES															
Structural	2.10¢	2.10¢[f]	2.10¢[f]		2.10¢[g]	2.10¢		(Bethlehem = 2.10¢)			2.45¢[b]	2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Duluth = 2.65¢) (Worcester = 2.70¢)					3.10¢			2.92¢.
Galvanized	3.40¢	3.40¢		3.40¢	3.40¢		(Duluth = 3.40¢)					3.90¢			
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)					3.70¢			3.52¢
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			2.72¢

[1] Mill run sheets are 10c per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to certain width and length limitations. [6] For merchant trade. [7] Prices for straight length material only, from a producer to a consumer. Functional discount of 25c. per 100 lb. to fabricators. [8] Also shafting. For quantities of 20,000 to 29,999 lb. [9] Carload lot in manufacturing trade. [10] These prices do not apply if the customary means of transportation (rail and water) are not used. [12] Boxed. [13] Portland and Seattle price San Francisco price is 2.50c. [14] This bright wire base price to be used in figuring annealed and bright finish wires, commercial spring wire and galvanized wire.

EXCEPTIONS TO PRICE SCHEDULE No. 6—On hot rolled carbon bars, Phoenix Iron Co. may quote $2.40, at established basing points. Calumet Steel division of Borg Warner may quote 2.35c., Chicago on bars from its 8-in. mill; Joslyn Mfg. Co. may quote 2.35c., Chicago base. On rail steel bars Sweets Steel Co. may quote 2.35c., f.o.b. mill. On hot rolled sheets, Andrews Steel Co. may quote shipment to Detroit area on Middletown base; Parkersburg Iron & Steel may quote $2.25 per hundred f.o.b. Parkersburg, W. Va. On galvanized sheets, Andrews Steel may quote 3.75c., at established basing points; Parkersburg Iron & Steel may quote $3.85 per hundred f.o.b. Parkersburg, W. Va. Apollo Steel Co. is permitted to charge $3.75 per 100 lbs. On hot rolled strip, Joslyn Mfg. Co. may quote 2.30c., Chicago base. On plates, Granite City Steel Co. may quote 2.35c., f.o.b. mill, and Central Iron & Steel Co. may quote 2.20c., f.o.b. basing points. On shapes, Phoenix Iron Co. may quote $2.35 established basing points and 2.50c. Phoenixville for export.

On rail steel merchant bars, Eckels-Nye Corp. may charge 2.40c. On tubing, South Chester Tube Co. may price Gulf or Pacific Coast all rail shipments and shipments west of Harrisburg on basis of f.o.b. Chester. On lend-lease sales to eastern seaboard, Sheffield Steel Co. and Colorado Fuel & Iron Corp. may sell f.o.b. mill. SEMI-FINISHED STEEL: *Billets, Rerolling*—Connors Steel Co., $50.69; Keystone Steel & Wire Co. may charge $36.40 per gross ton f.o.b. Peoria, Ill.; Phoenix Iron Co. $41.00; Continental Steel Corp. may sell Acme Steel Co. at $34.00 plus extras and freight; Ford Motor Co. $34.00 f.o.b. Dearborn, Mich.; Northwestern Steel & Wire Co. on Lend-Lease, $41.00; Wheeling Steel Co. on Lend-Lease, $36.00 for small billets f.o.b. Portsmouth, Ohio; *Billets, Forging Quality*—Follansbee Steel Corp. $49.50 f.o.b. Toronto; Andrews Steel Co. $50.00 at basing points; Pheonix Iron Co. $47.00. *Slabs*—Andrews Steel Co. $41.00; Empire Sheet & Tin Plate Corp. $41.00; Pheonix Iron Co. $41.00, rerolling grade, $47.00, forging grade. *Blooms*—Phoenix Iron Co. $41.00 rerolling grade. $47.00 forging grade. *Sheet Bar*—Empire Sheet & Tin Plate Corp. $39.00 f.o.b. mill; Wheeling Steel Corp. on Lend-Lease $37.00 f.o.b. Portsmouth, Ohio. *Other Exceptions*—Laclede Steel Co. on Lend-Lease through eastern seaboard may use Chicago basing point prices f.o.b. Alton and Madison, Ill. ALLOY STEEL BARS—Texas Steel Co. may use Chicago base f.o.b. Fort Worth.

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
Philadelphia	$3.518	$4.872[6]	$5.018a	$3.922	$4.772	$3.605	$3 666	$3.882	$4.072	....	$7.116	....	....
New York	3.590	4.613[3]	5.010	3.974[4]	4.774	3.768	3 758	3.853	4.103	$6.008	7.158	$7.303	$8.453
Boston	3.774	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.114	6.162	7.312	7.344	8.494
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Washington	3.596	4.841	5.196[4]	4.041	4.741	3.796	3.930	3.941	4.041	....	....	....	....
Chicago	3.25	4.20	5.23	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.90	8.85	8.00
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.137	7.087	8.237
Cleveland	3.35	4.40	4.877[4]	3 60	4.45	3.40	3.588	3.35	3.75	5.956	7.106	6.85	8.00
Buffalo	3.35	4.40	4.75[4]	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.90	6.85	8.00
Detroit	3.45	4.50	5.00[4]	3.70	5.909[17]	3.609	3.661	3.45	3.80	6.08	7.23	7.159	8.309
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.247[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.281	7.231	8.381
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	7.15	6.85	8.25
St. Paul	3.51	4.46	5.257[4]	3.86	4.35[17]	3.81[13]	3.81[13]	3.76[13]	4.361	6.09	7.24	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215		4.165	4.165	4.115	4.443	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.788	4.78	3.63	3.51	3.98	6.08	7.23	7.18	8.33
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.857	4.66	5.25	4.10	....	3.95	3.95	3.90	4.31	....	....	....	....
New Orleans	3.95	4.95	5.25	4.20	....	3.90	3.90	4.10	4.60	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.372
Los Angeles	5.00	7.20[3,7]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.15[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.96[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

NATIONAL EMERGENCY (N. E.) STEELS
(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar Strip	Billets, Blooms and Slabs	Bars and Bar Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10c	$2.00	.....	.....
NE 1335	.33/ .38	1.60 1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35	.....	.....	.....	.10	2.00	.....	.....
NE 8613	.12/ 17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	$25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40 .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.....	.....	.....	.40	8.00	.....	.....
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25	.....	.....	.65	13.00	.....	.....
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40	.....	.....	.65	13.00	.....	.....
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30 .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1 25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30 .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

*Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1999 lb.; strip, extras on all quantities; bars, 1500 to 39,999 lb.; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 to 39,999 lb. (15) 1000 to 39,999 lb. (16) 1500 to 39,999 lb. (17) 2000 to 39,999 lb. (18) 3500 to 39,999 lb.

(a) Philadelphia: Galvanized sheets, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago.... $54.80
6-in. and larger, del'd New York... 52.20
6-in. and larger, Birmingham 46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles 69.40
6-in. and larger f.o.b. cars, Seattle. 71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

Per Gross Ton

Old range, bessemer, 51.50 ..... $4.75
Old range, non-bessemer, 51.50..... 4.60
Mesaba, bessemer, 51.50 ..... 4.60
Mesaba, non-bessemer, 51.50 ..... 4.45
High phosphorus, 51.50 ..... 4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

PRICES

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Steel

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton	54.00

Shell Steel

	Per Gross Ton
4 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham. Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 1c. higher.

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	21.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

PRICES

COKE

Furnace

	Per Net Ton
†Connellsville, prompt	$7.00*

Foundry

†Connellsville, prompt	7.50
Fayette County, W. Va. (Beehive)	8.10
By-product, Chicago	$12.60†
By-product, New England	13.75
By-product, Newark	12.40 to 12.95
By-product, Philadelphia	13.38
By-product, Cleveland	12.30
By-product, Cincinnati	11.75
By-product, Birmingham	9.30†
By-product, St. Louis	12.02
By-product, Buffalo	12.50

*Hand-drawn ovens using trucked coal are permitted to charge $7.75 per net ton, plus usual transportation. Maximum beehive furnace coke prices established by OPA, Nov. 29, 1943. †F.o.b. oven.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	Base price per short ton
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick	Per 1000
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
Chrome Brick	Per Net Ton
Standard, chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$44.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

INGOTS

Carbon, Rerolling grade

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25; Carnegie-Illinois Steel Corp. (Pencoyd Plant), $38.25.

Carbon, Forging Quality

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports.

Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

PRICES

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Base per Keg	Pacific Ports
Standard wire nails	$2.55	....
Coated nails	2.55	$3.05
Cutnails, carloads	3.85	....
	Base per 100 Lb.	**Pacific Ports**
Annealed fence wire	$3.05	$3.85
Annealed galvanized fence wire	3.40	3.90
	Base Column	**Pacific Ports**
Woven wire fence*	.67	.85
Fence posts (carloads)	.69	.85
Single loop bale ties	.59	.76
Galvanized barbed wire†	.70	....
Twisted barbless wire	.70	....

*15½ gage and heavier. †On 80-rod spools in carload quantities.

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
⅛ in.	63½	51
¼ in.	66½	55
⅜ to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
⅛ in.	25	3½
¼ in.	30	10
⅜ and ½ in.	34	16
¾ in.	38	18½
1 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
⅛ in.	61½	50½
¼ in.	65½	54½
⅜ to 3 in.	67	57
Wrought Iron (Same as Above)		
⅛ in.	25	6
¼ in.	31	12
⅜ to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston (3)	*$25.50*	*$25.00*	*$26.50*	*$25.50*	.....	.....
Brooklyn	*27.50*			*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (5)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass (3)	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50	.....
Birdsboro, Pa. (4)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*23.94*	*23.94*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50		24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.76*	.....	*27.26*	*26.76*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable.

(2) Price shown is for low-phosphorous iron; high-phosphorous sells for $28.50 at the furnace.

(3) Eastern Gas & Fuel Associates, Boston, is permitted to sell pig iron produced by its selling company, Mystic Iron Works, Everett, Mass., at $2 per gross ton above maximum prices.

(4) E. & G. Brooke Co. permitted to charge $1.00 per ton extra.

(5) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 per cent to 2.25 per cent); phosphorous differentials, a reduction of 38c. per ton for phosphorous content of 0.70 per cent and over; manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. For ton lots f.o.b. shipping point, in cents per lb.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh	13½ to 15c.
Iron, crushed, 200 mesh and finer	4c.
Iron, hydrogen reduced, 300 mesh and finer	63c.
Iron, electrolytic, unannealed, coarser than 300 mesh	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh	42c.
Iron, carbonyl, 300 mesh and finer	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh,	11½ to 12½c.
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	Hot Rolled	Lap Weld, Hot Rolled
2 in. o.d.	13 B.W.G. 15.03	13.04	12.33
2½ in. o.d.	12 B.W.G. 20.21	17.54	16.58
3 in. o.d.	12 B.W.G. 22.48	19.50	18.35
3½ in. o.d.	11 B.W.G. 28.37	24.62	23.15
4 in. o.d.	10 B.W.G. 35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65 ½
9/16 & ⅝ in. x 6 in. & shorter	63 ½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all length	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full container lots, 10 per cent additional discount.

Stove Bolts

Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets *(½ in. and larger)*

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets *(7/16 in. and smaller)*

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws

	Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angles bars, 100 lb.	2.70
California Ports	$3.15
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports. tie plates alone—Steelton, Pa., Buffalo. Spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

PRICES

Ferromanganese

78-82% manganese, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Ton lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Electrolytic Manganese

99.9% manganese, maximum base contract price per lb. of metal, bulk, f.o.b. shipping point, with freight allowed to destination. Size 1" x D.

	Eastern Zone	Central Zone	Western Zone
Carload lots	37.60c.	37.85c.	38.15c.
l.c.l. lots	39.60c.	38.60c.	40.65c.

Spiegeleisen

Maximum base contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 1% max. Si	19-21% Mn 1% max. Si	26-28% Mn 1% max. Si
Carloads	$35.00	$36.00	$49.50
Less ton*	47.50	48.50	62.00

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% silicon	6.65c.	7.10c.	7.25c.
75% silicon	8.05c.	8.20c.	8.75c.

Spot sales 45c. per lb. higher for 50% Si; 30c. for 75% Si. For extras and premiums see MPR 405.

Silvery Iron

(*Per Gross Ton, base 6.00 to 6.50 Si*)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorus or over.

*Official OPA price established June 24, 1941.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% silicon.

	Eastern Zone	Central Zone	Western Zone
Car lots	3.35c.	3.50c.	3.65c.

Spot prices ¼c. higher per lb. of briquet. For premiums and extras see MPR 405.

Silicomanganese

(*Per gross ton, delivered, carloads, bulk*)

3.00 carbon	$120.00*
2.50 carbon	125.00*
2.00 carbon	130.00*
1.00 carbon	140.00*
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.†
Packed	6.05c.†
Less ton lots	6.55c.†

*Spot prices are $5 per ton higher.
†Spot prices ¼c. higher.

Ferrochrome

(65-72% *Cr*, 2% *max. Si*)

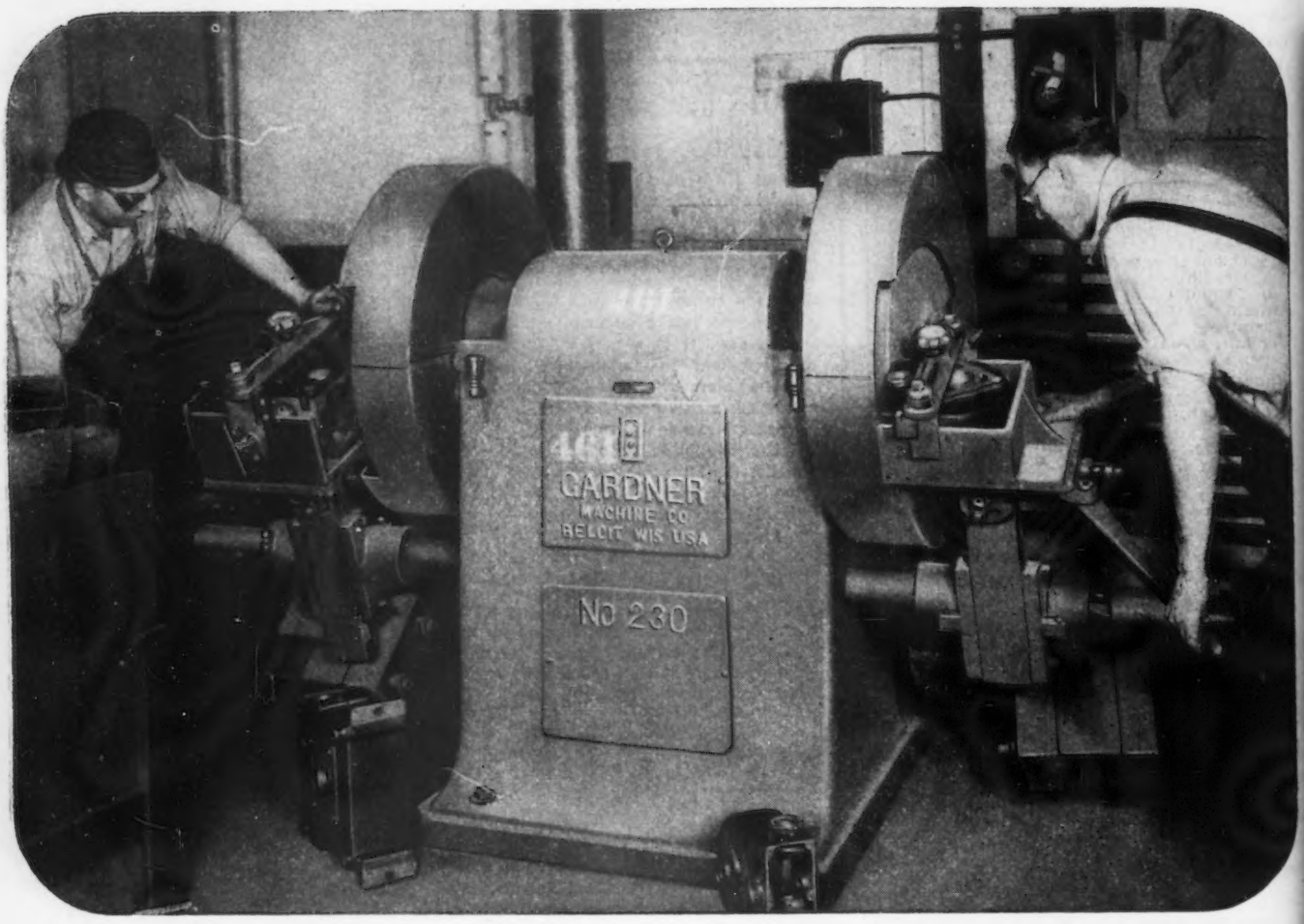
OPA maximum base contract prices per lb. of contained Cr, lump size in carlots, f.o.b. shipping point, freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
0.03% carbon	25.00c.	25.40c.	26.00c.
0.06% carbon	23.00c.	23.40c.	24.00c.
0.10% carbon	22.50c.	22.90c.	23.50c.
1.00% carbon	20.50c.	20.90c.	21.50c.
2.00% carbon	19.50c.	19.90c.	20.50c.

Spot prices are ¼c. higher per lb. contained Cr. For extras and premiums see MPR 407.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. producer's plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten. 10,000 lb. or more	$1.90
Ferrovanadium, 30-35%, contract basis, f.o.b. producer's plant, usual freight allowances, any quantity, per lb. contained vanadium.	
Open Hearth	$2.70
Crucible	$2.80
Primos	$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal	$1.50
Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5	$1.10
Ferroboron, contract basis, 17.50% boron minimum, f.o.b. Niagara Falls, carlots, per lb. alloy	$1.20
Ton lots	$1.25
Silcaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy	23c.
Silvaz No. 3, contract basis, f.o.b. Niagara Falls, all quantities, per lb. of alloy	40c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 100 lb. and over, maximum based on rate to St. Louis, per lb.	45c.
Bortam, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Borosil, 3% to 4% boron, 40 to 45% silicon, f.o.b. Philo, Ohio, per lb. contained boron	$6.25
Ferrocolumbium, 50% to 60%, f.o.b. Niagara Falls, ton lots, per lb. contained columbium	$2.25
Less ton lots	$2.30
Ferrotitanium, 40%-45%, f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained titanium	$1.23
Less ton lots	$1.25
Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium	$1.35
Less ton lots	$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per gross ton	$142.50
3%-5% carbon	$157.50
Ferrophosphorus, 18% electric or blast furnace, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton	$75.00
Ferromolybdenum, 55-75 per cent, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum	95c.
Calcium molybdate, 40%-45%, contract basis, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained molybdenum	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb contained Mo	80c.
Zirconium, 35-40%, contract basis, carloads in bulk or package, per lb. of alloy	15c.
Less ton lots	16c.
Zirconium, 12-15%, contract basis, carlots, bulk, per gross ton	$102.50
Packed	$107.50
Less ton lots	$112.50
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, per lb.	7.50c.
Ton lots	8c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.75c.
Ton lots	9.25c.
Less ton lots	9.75c.



Subtracting hours from the *DAILY GRIND!*

The time required to finish a machine part depends largely upon the amount of excess metal that must be removed before the necessary tolerances are met. If the part is a casting, the operation is often slow and costly.

But . . . if the part is drop-forged, this operation is greatly simplified. Drop forgings are formed in precision-made dies. Therefore, they can be held to uniformly close tolerances, leaving very little excess metal to be removed. Machining time is reduced to an absolute minimum . . . costly man-and-machine hours are saved . . . and valuable metal is conserved.

When you add this saving of hours and dollars to the extra strength and stamina of a forged part, the freedom from concealed defects, and the absence of deadweight, you'll see why more and more manufacturers are depending upon Forgings by Phoenix.

In much of the fighting equipment that is daily bringing us closer to Victory, Forgings by Phoenix are playing an important part. And they will be equally important in the production of equipment for a peacetime world.

Plan now for tomorrow. Our engineers will gladly consult with you on any problem involving the use of forgings, and your request incurs no obligation.

Forging Division of

PHOENIX MANUFACTURING COMPANY

CATASAUQUA PENNSYLVANIA

Forgings by **PHOENIX**

TIME-FUSE GEARS

As the giant naval shell hurtles through the sky on its way over the horizon toward an Axis ship, a tiny, precision-built "clock" deep inside the projectile's steel walls ticks off the fateful seconds. The shell plunges down on its target, the little clock "strikes," touching off the mighty blast.

Bethlehem Steel Company makes bar steel for many parts of the complicated time fuses used in both naval and army artillery shells, including the miniature gears shown above.

Tiny, super-accurate fuse mechanism parts are at one end of the size range. At the other end are such items as great turbine rotors, ship shafting, and huge guns. In all of these applications, and in hundreds of others in between, Bethlehem Alloy Steels are effectively serving in the war effort.

★ ★ **BETHLEHEM STEEL COMPANY, Bethlehem, Pa.** ★ ★

Bethlehem Steel Export Corporation, New York City

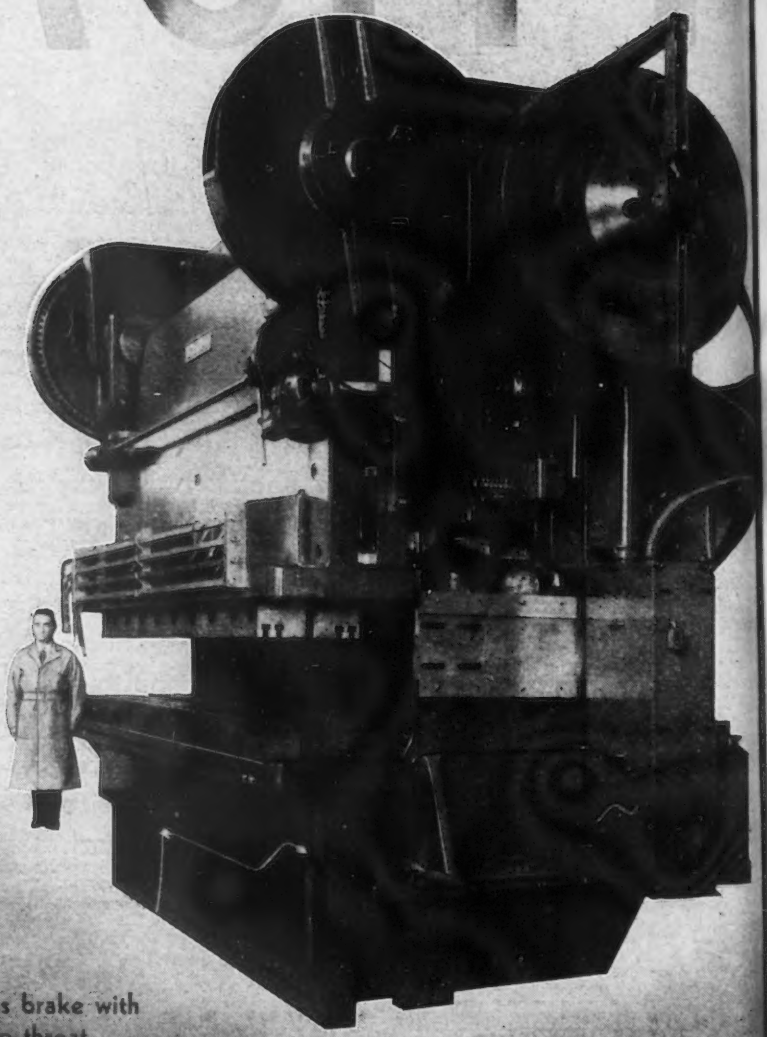
BETHLEHEM STEEL

★ ★ ★

An unusually long squaring shear, 18′ 3″ between housings, particularly adapted to aircraft work

CAPACITY

For the long job • • • for the big job. Cincinnati Shears and Cincinnati Brakes have what it takes • • • speed • • • power • • • accuracy.



An exceptionally large press brake with high die space and deep throat

THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

SHAPERS · SHEARS · BRAKES

PASSING THE AMMUNITION

LARGEST and heaviest of its type, this U. S. Coast Artillery 90-mm. anti-aircraft gun can be *fired while moving* through a vertical arc, or while swinging in a complete circle. Supplying this and thousands of other guns requires ever increasing quantities of ammunition.

In meeting the requirements, not only for ammunition, but for guns, ships, tanks and planes, war plants everywhere are assured of faster machining and longer life of cutting tools, by using *Texaco Cutting Oils.*

Texaco Cutting Oils, (Sultex, Transultex and Cleartex), lubricate the tools, prevent chip welding and carry away the heat, assuring improved surface finish, and maximum output per tool grind.

So effective have Texaco Lubricants proved that they are definitely preferred in many important fields, a few of which are listed in the panel.

A Texaco Engineer specializing in cutting coolants will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

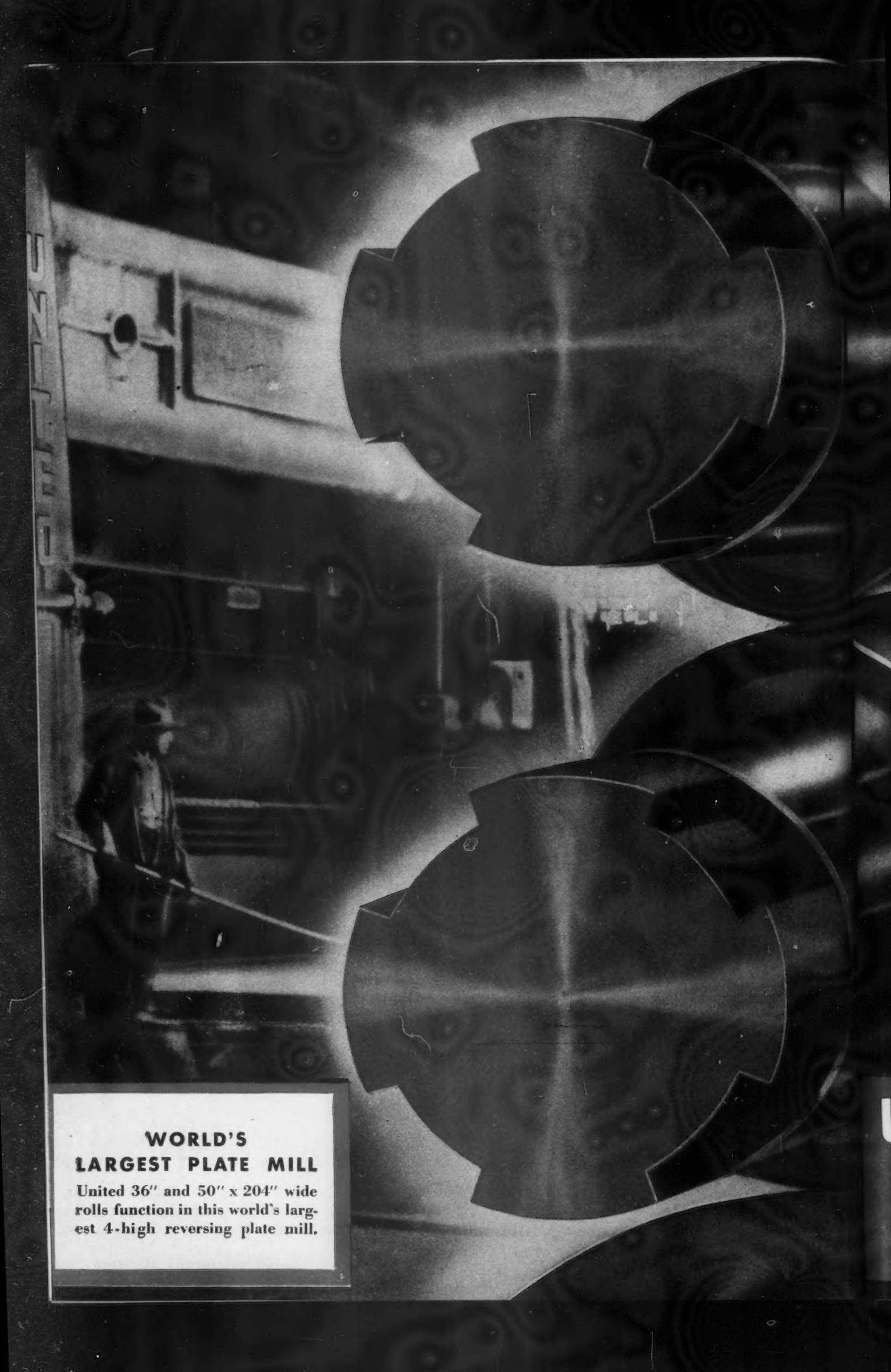
★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other other brand.

TEXACO

TEXACO Cutting and Soluble Oils

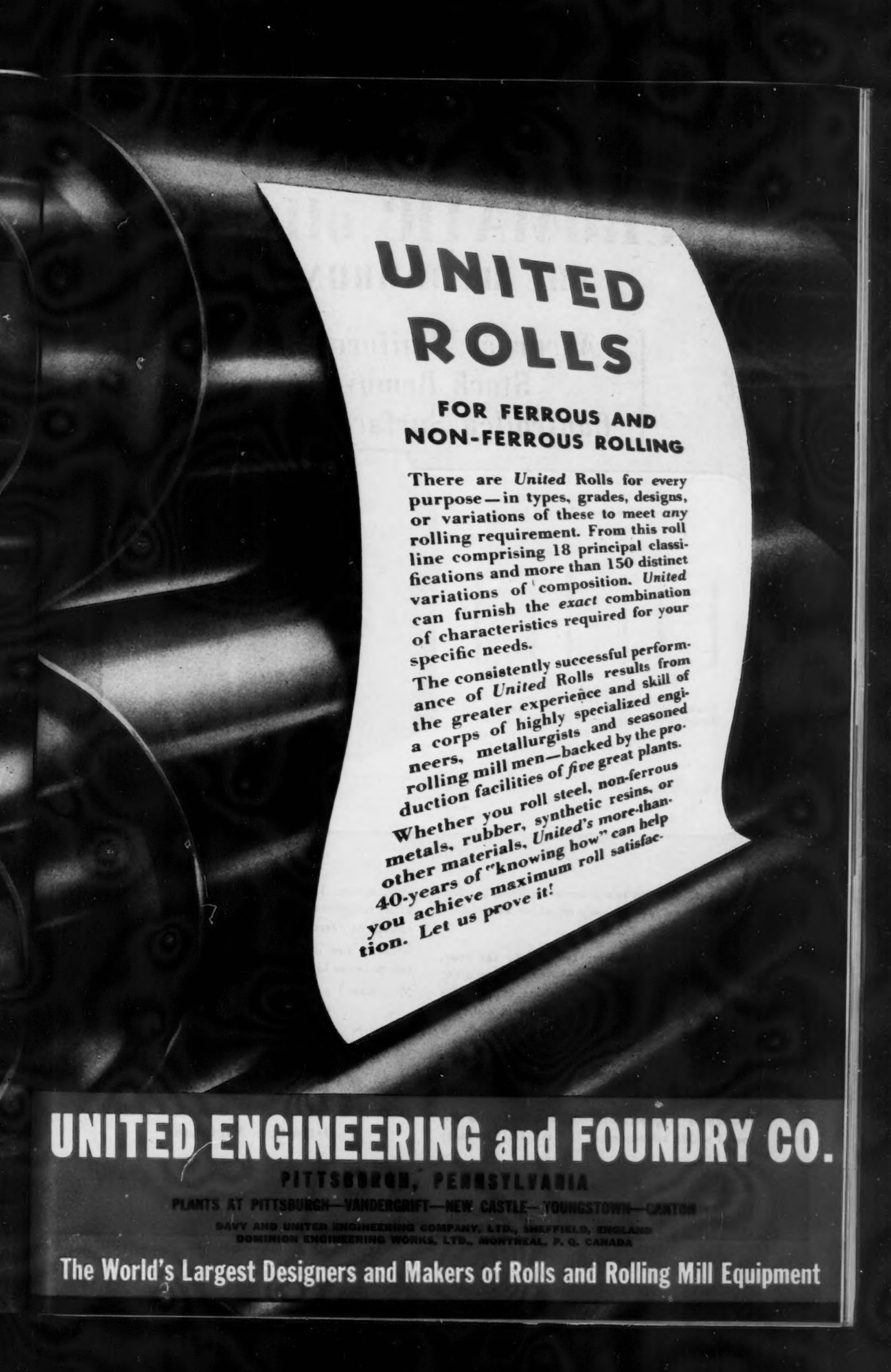
FOR FASTER MACHINING

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY



WORLD'S LARGEST PLATE MILL

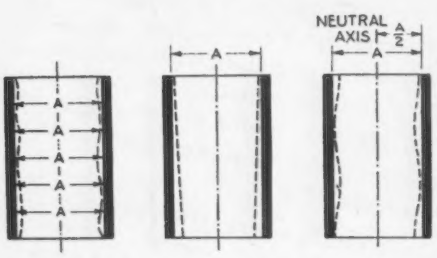
United 36" and 50" x 204" wide rolls function in this world's largest 4-high reversing plate mill.


UNITED
ROLLS
FOR FERROUS AND
NON-FERROUS ROLLING
There are *United* Rolls for every purpose—in types, grades, designs, or variations of these to meet *any* rolling requirement. From this roll line comprising 18 principal classifications and more than 150 distinct variations of composition, *United* can furnish the *exact* combination of characteristics required for your specific needs.
The consistently successful performance of *United* Rolls results from the greater experience and skill of a corps of highly specialized engineers, metallurgists and seasoned rolling mill men—backed by the production facilities of *five* great plants.
Whether you roll steel, non-ferrous metals, rubber, synthetic resins, or other materials, *United's* more-than-40-years of "knowing how" can help you achieve maximum roll satisfaction. Let us prove it!
UNITED ENGINEERING and FOUNDRY CO.
PITTSBURGH, PENNSYLVANIA
PLANTS AT PITTSBURGH—VANDERGRIFT—NEW CASTLE—YOUNGSTOWN—CANTON
DAVY AND UNITED ENGINEERING COMPANY, LTD., SHEFFIELD, ENGLAND
DOMINION ENGINEERING WORKS, LTD., MONTREAL, P. Q. CANADA
The World's Largest Designers and Makers of Rolls and Rolling Mill Equipment

MICROMATIC offers you
THE HYDROHONER

[Accuracy, Uniform Size
Stock Removal
Controlled Surface Finish]

THE HONING PROCESS



Diametric Roundness

GENERATES
Diametric Straightness

Axial Straightness

CORRECTS
Taper

Out-of-roundness

Axial Distortion

**Micromatic Hydrohoner—
With Automatic Microsize . . .
Precision Hones to uniform size.
Machine stops when correct size is reached.**

Micromatic Honing is a process for finish machining cylindrical surfaces—internal or external by means of controlled abrasion.

Abrasive sticks positively expanded by the hone, are rotated in contact with the work and are given one or more reciprocating motions at the same time—all actuated under extremely low speeds and pressures.

Stock is removed at rates up to .001" per minute on diameter—to more than 1 cubic inch per minute in volume on hard, forged steel.

Roundness is generated—out-of-roundness is corrected within tolerances as low as .0001" in many applications. Taper is corrected and diametric and axial straightness is generated by stones long enough to overcome deformity.

Uniform size is generated in high production to tolerances as low as .0005".

Microhoned surface finish may be controlled to any degree—from matte (grey) to mirror (black).

MICRO MATIC

Micromatic
HONE CORPORATION
Detroit 4, Michigan

MAKERS OF HONING MACHINE TOOLS

a New VERTICAL HYDROHONER

A High Production Vertical Type Hydrohoner

Diameter of Work . . . ¾" to 2".

Spline Driven Head Reciprocating Stroke . . . 15".

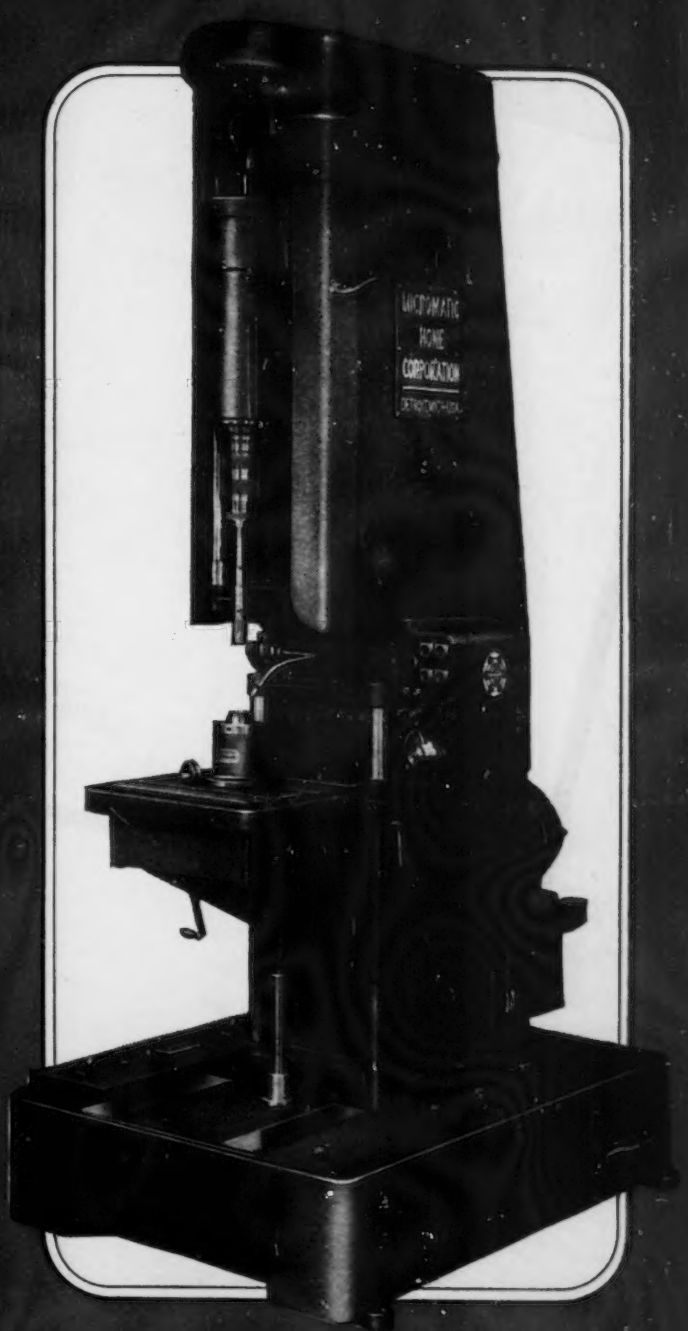
Spindle Oscillating Stroke . . . 0 to ¾".

Centralized Hydraulic Operating Control Panel provides easy operation—fast production. Hydraulic tool expansion assures uniform pressure and cutting rates for fast precision work.

Other features are—hydraulic timer—full ventilated hydraulic oil tank of 60-gallon capacity mounted in base.

Also available with 3-speed transmission, rising screw table, electric timer, special coolant filter, and special coolant refrigeration.

Available for normal prompt delivery.



MICRO MATIC

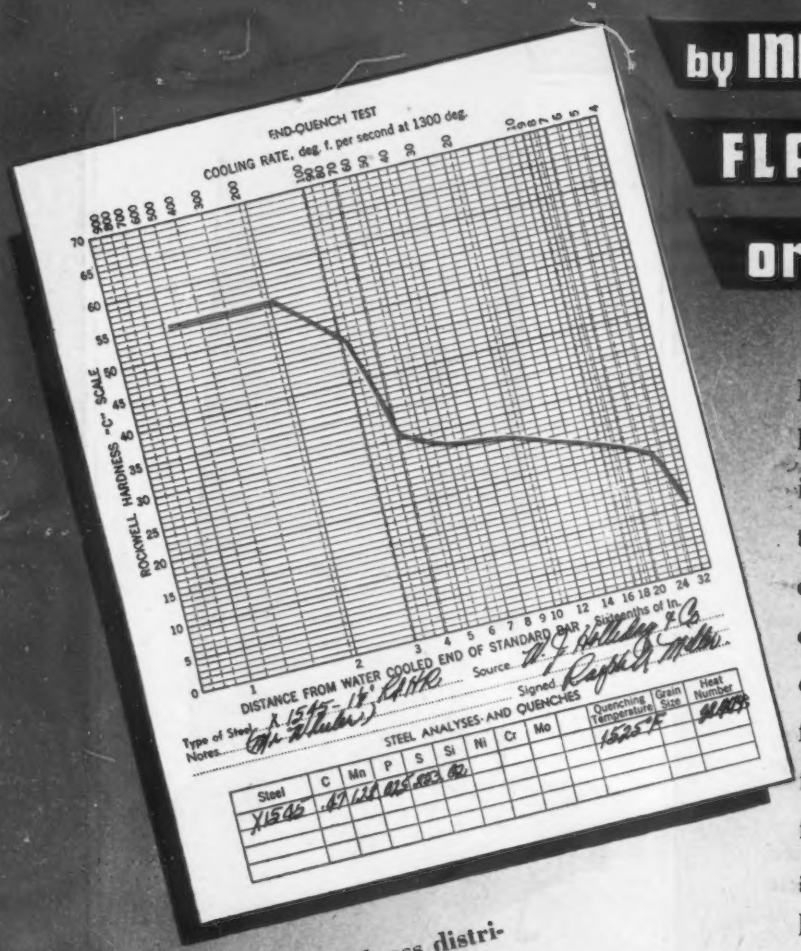
Micromatic HONE CORPORATION

DETROIT 4, MICHIGAN

SPEED TREAT PLATE

IS THE IDEAL STEEL FOR PARTS TO BE SURFACE-HARDENED—

by INDUCTION HARDENING
FLAME HARDENING
or PACK HARDENING



A typical hardness distribution chart: jominy or end quench test from an average heat of *Speed Treat*.

Machine and equipment builders have found *Speed Treat* plate the ideal steel for making parts of every type that are to be induction, flame or pack hardened for this steel offers full development of the most desired properties: rapid transformation of structure, higher surface hardness and a ductile core, freedom from distortion and negligible scaling. Speed, accuracy and hardness control are simplified and hardening cost is reduced to a new low.

***Fastest machining of any medium carbon steel*—a recognized advantage of *Speed Treat* steel—implies its logical use by all production machinery builders.**

W. J. HOLLIDAY & CO.

Hammond, Ind.

"Established 1856"

Indianapolis, Ind.

Brown-Wales Company
493 C Street
Boston, Mass.

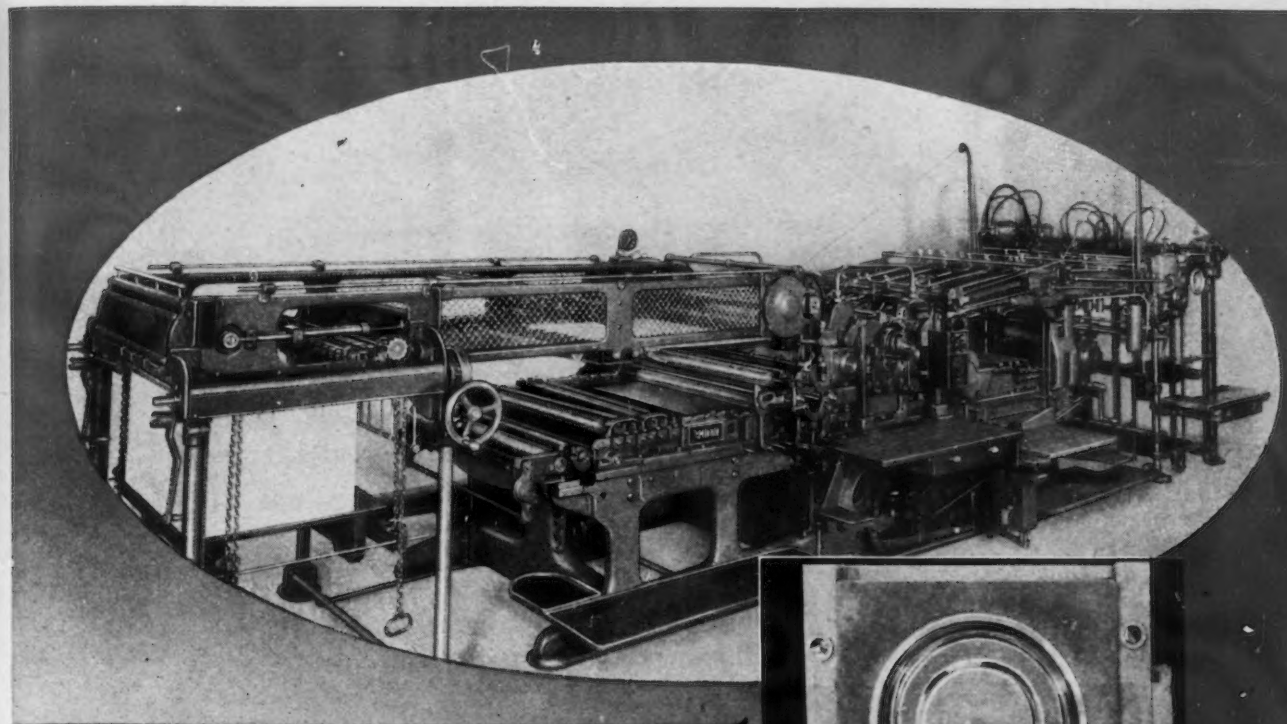
Beals, McCarthy & Rogers, Inc.
Buffalo, N. Y.

American Wholesale Hardware Company
1500 W. Anaheim St.,
Long Beach, Calif.

Horace T. Potts Company
East Erie Avenue & D Street
Philadelphia, Pa.

Burger Iron Company
Akron, Ohio

Peckover's Limited
77 Front Street, E
Toronto, Ont., Canada



SPEED TREAT STEEL

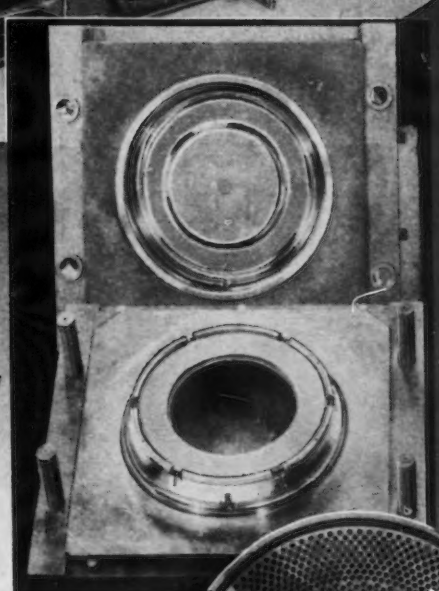
Assures Higher Quality

And Longer Life

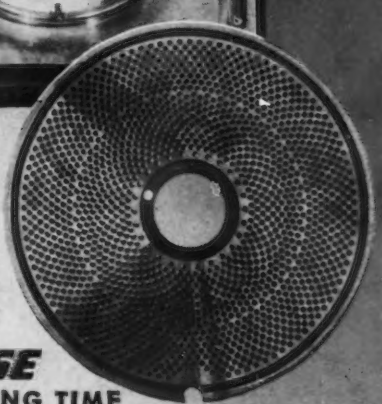
The problem of surface-hardening teeth of odd-shaped gears, the wearing surfaces of cams, racks and bearer rings used in the construction of high grade printing presses was quickly solved by this manufacturer by induction hardening these parts of *Speed Treat* steel.

In parts of this type, the use of this faster machining steel contributes savings up to 32% in reduced machining time and longer tool life; improved finish also resulting. You can effect similar economies in your production by adopting *Speed Case* and *Speed Treat* steel plate for machined parts.

Send for new illustrated Catalog No. 1243. Contains complete story and technical details on *Speed Case* and *Speed Treat* steel plate. Every mold, die and machinery designer, builder and production man should have a copy.



A mold maker says: "*Speed Case* meets all requirements. The mold shown, for making clock cases, called for an extremely hard, high polished surface. Lower die 6" plate, top die 5" plate. Carburized with maximum distortion of .005". Steam plate, also made of *Speed Case*—it surely meets all requirements.



SPEED CASE

REDUCES DRILLING TIME

54.5% PLUS—

A meat grinder plate and knife manufacturer reports: "Using *Speed Case* plate, we reduced drilling time 54.5%, facing time 41.25% and drill costs 93.75%."

SPEED TREAT *Free Machining Medium Carbon Steel Plate*

SPEED CASE *Free Machining Open Hearth Steel Plate*

Quality Controlled *Speed Case* and *Speed Treat* steels are available in all common plate sizes, hot rolled and cold finished bars.

W. J. HOLLIDAY & CO.

Hammond, Ind. — *"Established 1856"* — Indianapolis, Ind.

Brown-Wales Company
493 C Street
Boston, Mass.

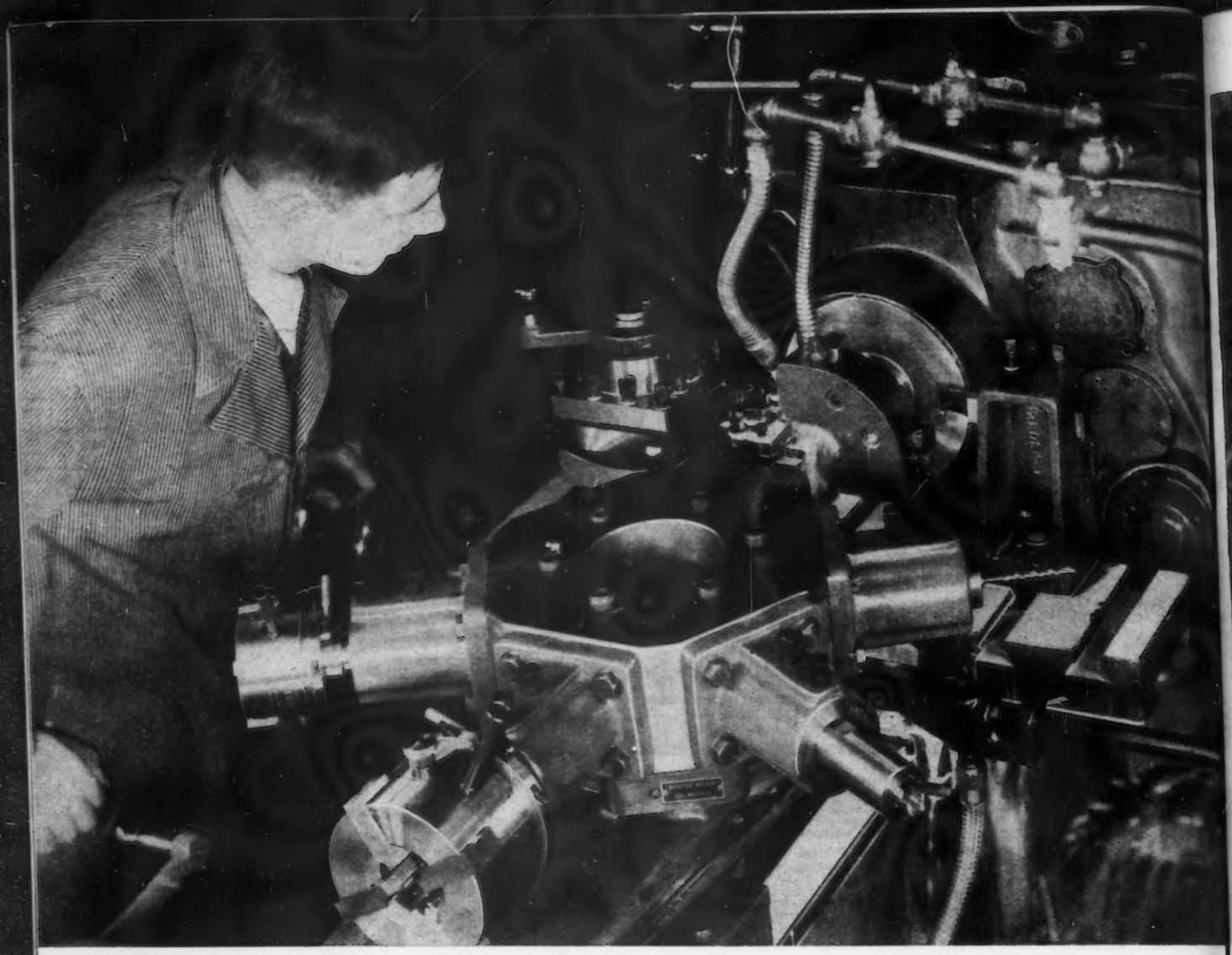
Beals, McCarthy & Rogers, Inc.
Buffalo, N. Y.

American Wholesale Hardware Company
1500 W. Anaheim St.,
Long Beach, Calif.

Horace T. Potts Company
East Erie Avenue & D Street
Philadelphia, Pa.

Burger Iron Company
Akron, Ohio

Peckover's Limited
77 Front Street, E
Toronto, Ont., Canada

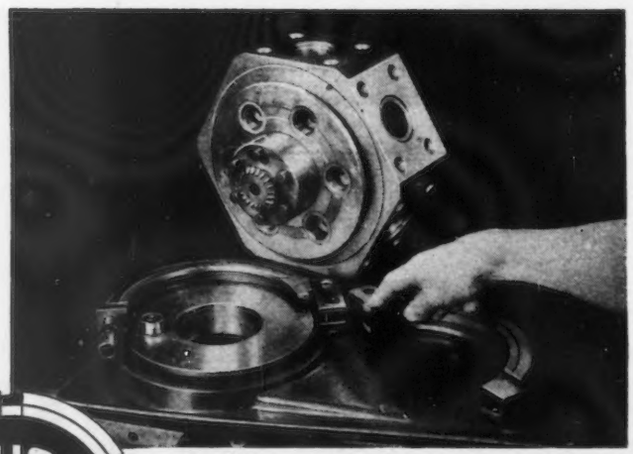


WORK GOES *FASTER...*

with Gisholt's Automatic Turret Indexing and Clamping

A turn of the pilot wheel is all it takes to withdraw the hexagon turret on a Gisholt Ram-Type turret lathe—and to unclamp and index it to the next position. As the slide again moves forward to approach the work, the new turret face, accurately located square with the spindle, is automatically clamped in rigid cutting position. To complete the entire cycle, the operator doesn't take his hand from the pilot wheel.

The automatic indexing and clamping provided by Gisholt is the most efficient known on a turret lathe. It makes turret lathe operation simpler and easier. It speeds war production, *now*—cuts costs *anytime.*



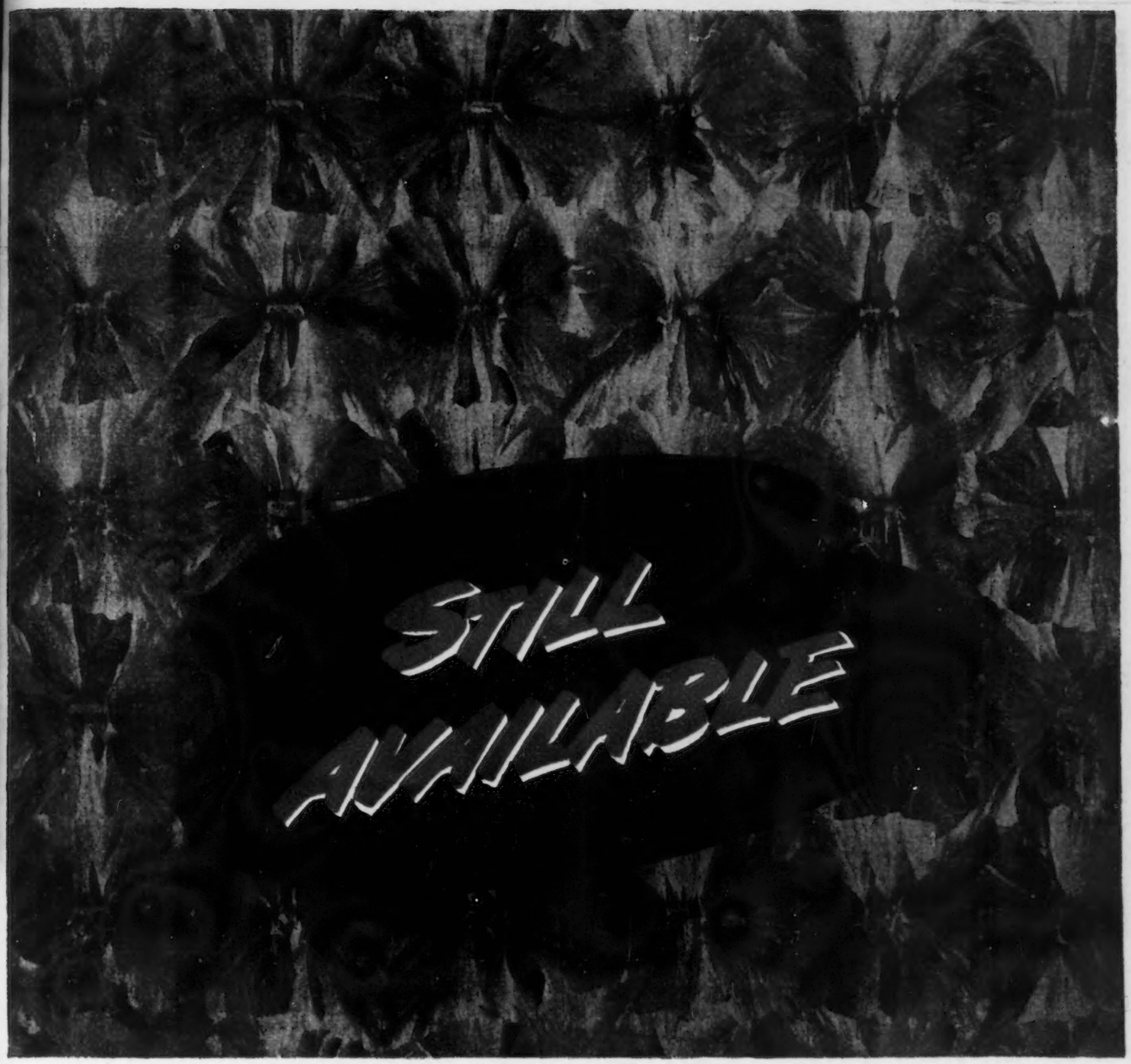
The tapered steel locating pin and bushings are hardened and ground to assure accuracy for the life of the machine. The double beveled clamp ring, operated by a powerful eccentric toggle, relieves the locating pin of all strain in taking heavy cuts.

GISHOLT MACHINE COMPANY
1215 E. Washington Ave. • Madison 3, Wisconsin

Look Ahead—Keep Ahead—With
Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES



For difficult forming

WEIRTON HOT DIPPED GALVANIZED SHEETS

Where severe fabrication is a problem, today's answer is Weirton Tite Coat Galvanized Sheet. Weirton's method of coating results in a bond of exceptional strength . . . And this, in spite of the war's elimination of tin in the dipping process. Naturally, Weirton's standard of uniformity and ductility are strictly maintained . . . This product is extensively used in important war products. You will find it entirely satisfactory.

Bars . . . Structurals . . . Piling . . . Hot and Cold Rolled Sheets and Strip . . . Galvanized Sheets . . . Lead Alloy Sheets Electrolytic Zinc Coated Sheets and Strip.

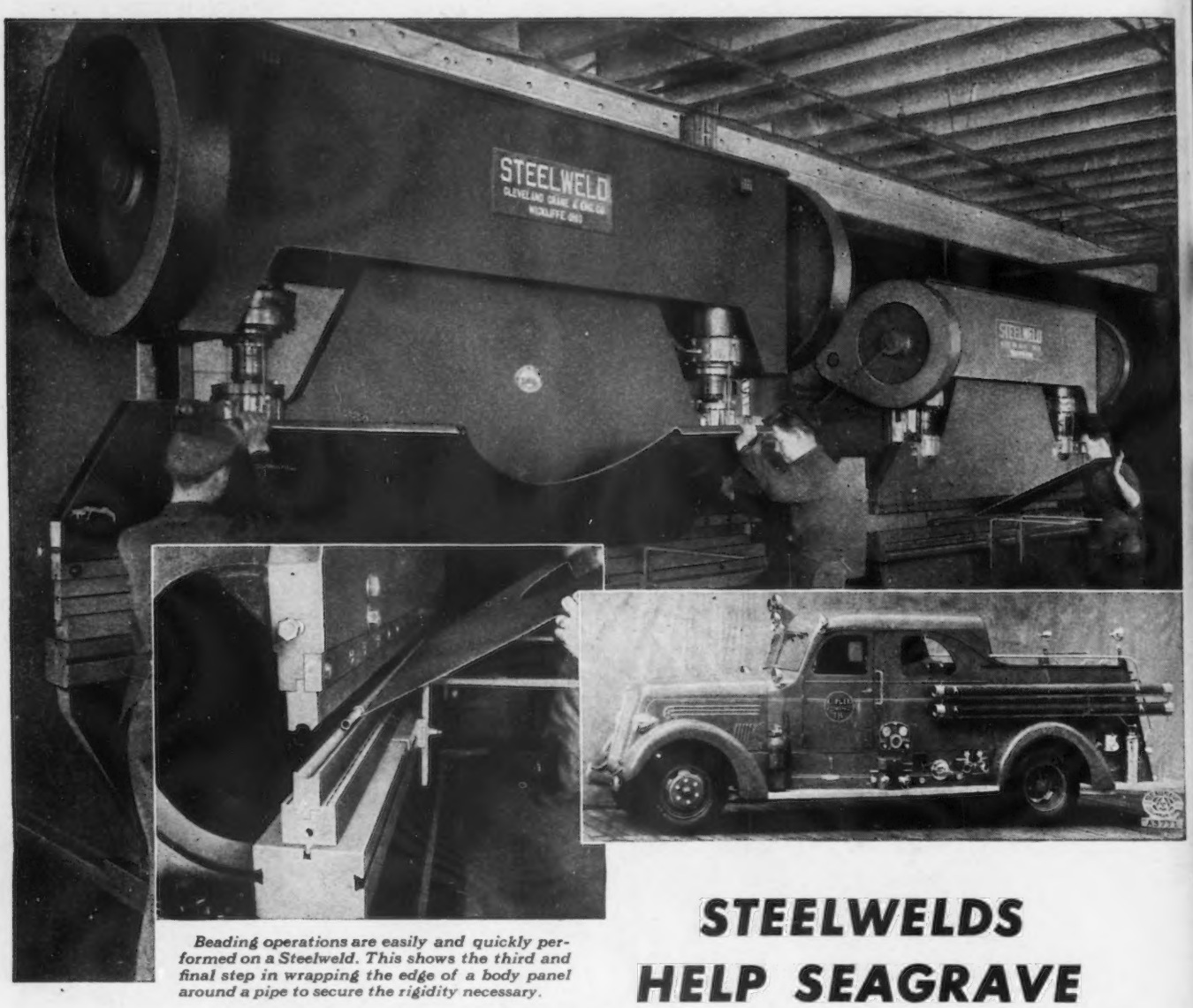
Cold Reduced Tin Plate, Hot Dipped and Electrolytic . . . Special Coated Manufacturing Ternes . . . Tin Mill Black Plate . . . Lacquered Tin Plate and Black Plate.

WEIRTON STEEL COMPANY

WEIRTON, WEST VIRGINIA

Sales Offices in Principal Cities

Division of **NATIONAL STEEL CORPORATION** *Executive Offices, Pittsburgh, Pa.*



Beading operations are easily and quickly performed on a Steelweld. This shows the third and final step in wrapping the edge of a body panel around a pipe to secure the rigidity necessary.

STEELWELDS HELP SEAGRAVE BUILD MODERN FIRE APPARATUS

Body panels, hoods, fender aprons, dashes, running boards, gas tanks, and other parts for the pumpers, ladder trucks and fire-fighting equipment made by The Seagrave Corporation, Columbus, Ohio, are fabricated on their two Steelweld Bending Presses.

These parts requiring bending, forming, louvering, beading, punching and notching, are formed a few at the time in production runs as the demand requires. It is easy to switch from one operation to another because it is a quick, simple matter to change the dies.

The satisfactory performance of the first press, a model I-10 installed in 1936, led to the purchase of a second machine in 1941, a model F3-8. The older press handles plate up to $\frac{1}{4}$-inch by 13 feet and the newer machine up to $\frac{3}{16}$-inch by 11 feet.

By replacing sharp welded or riveted corners wherever possible by quickly made, smooth, round, bended ones, the Steelwelds are proving an important factor in providing the modern, sleek appearance characteristic of Seagrave fire apparatus.

GET THIS BOOK!
CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated

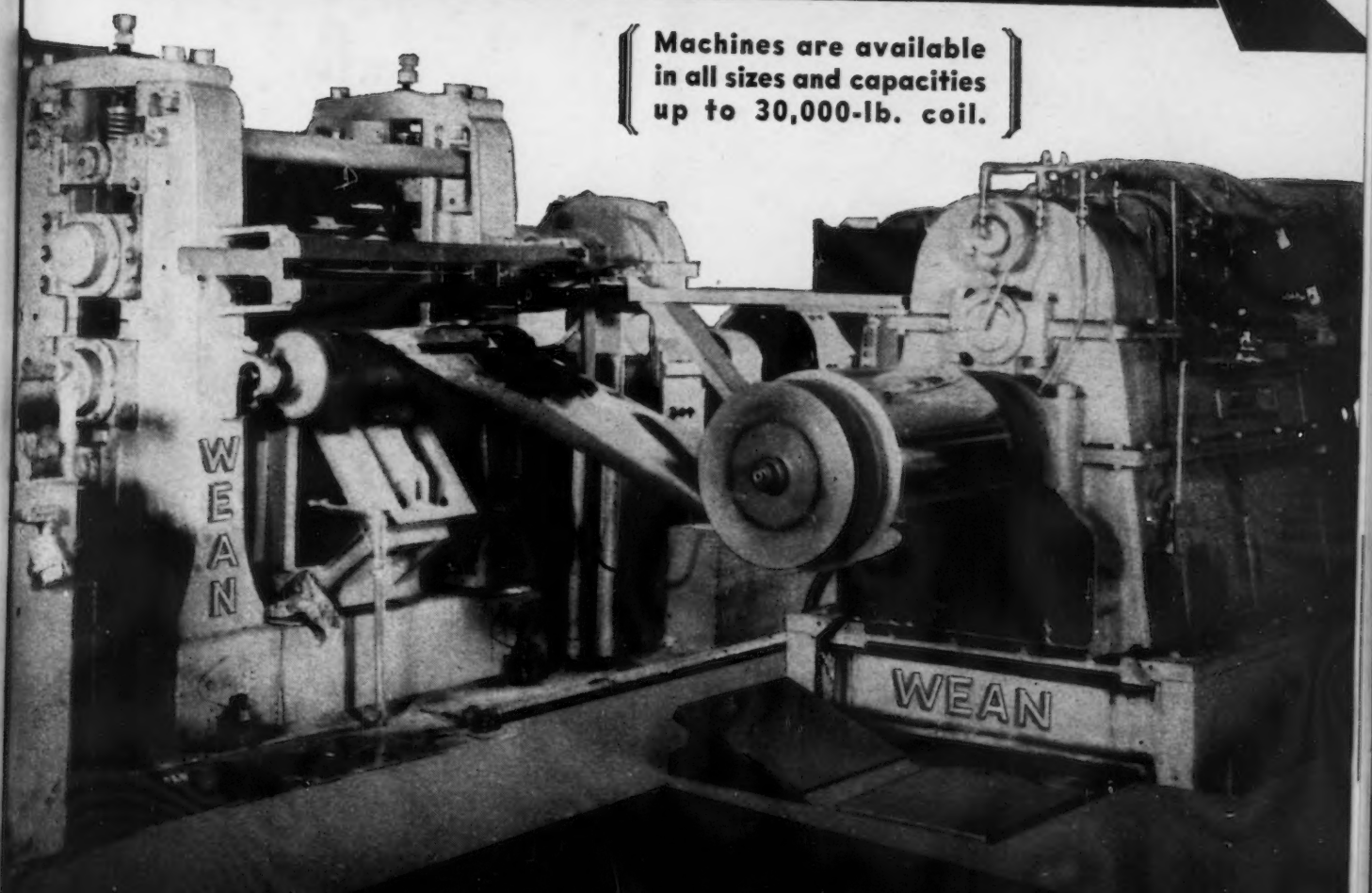
THE CLEVELAND CRANE & ENGINEERING CO.
1115 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND
STEELWELD PRESSES
GENERAL SALES AGENTS: THE CYRIL BATH CO., E. 70TH & MACHINERY AVE., CLEVELAND

WEAN

AUTOMATICALLY ADJUSTED STRIP REEL

Machines are available in all sizes and capacities up to 30,000-lb. coil.



HEAVY PLATE LEVELERS

HI-SPEED SHEET AND TIN MILL SHEAR LINES

ELECTROLYTIC & BONDERIZING TIN PLATE EQUIPMENT

WILSON TUBE ANNEAL FURNACES

WEAN VACUUM CUP SHEET AND PLATE LIFTERS

CONTINUOUS STRIP PICKLING, SLITTING, SIDE TRIMMING, AND RECOILING LINES

WIRE AND FENCE MACHINERY

The WEAN ENGINEERING CO., Inc. - - WARREN, OHIO

Associate Companies

LEE WILSON ENGINEERING CO., INC. CLEVELAND, OHIO

THE McKAY MACHINE CO. YOUNGSTOWN, OHIO

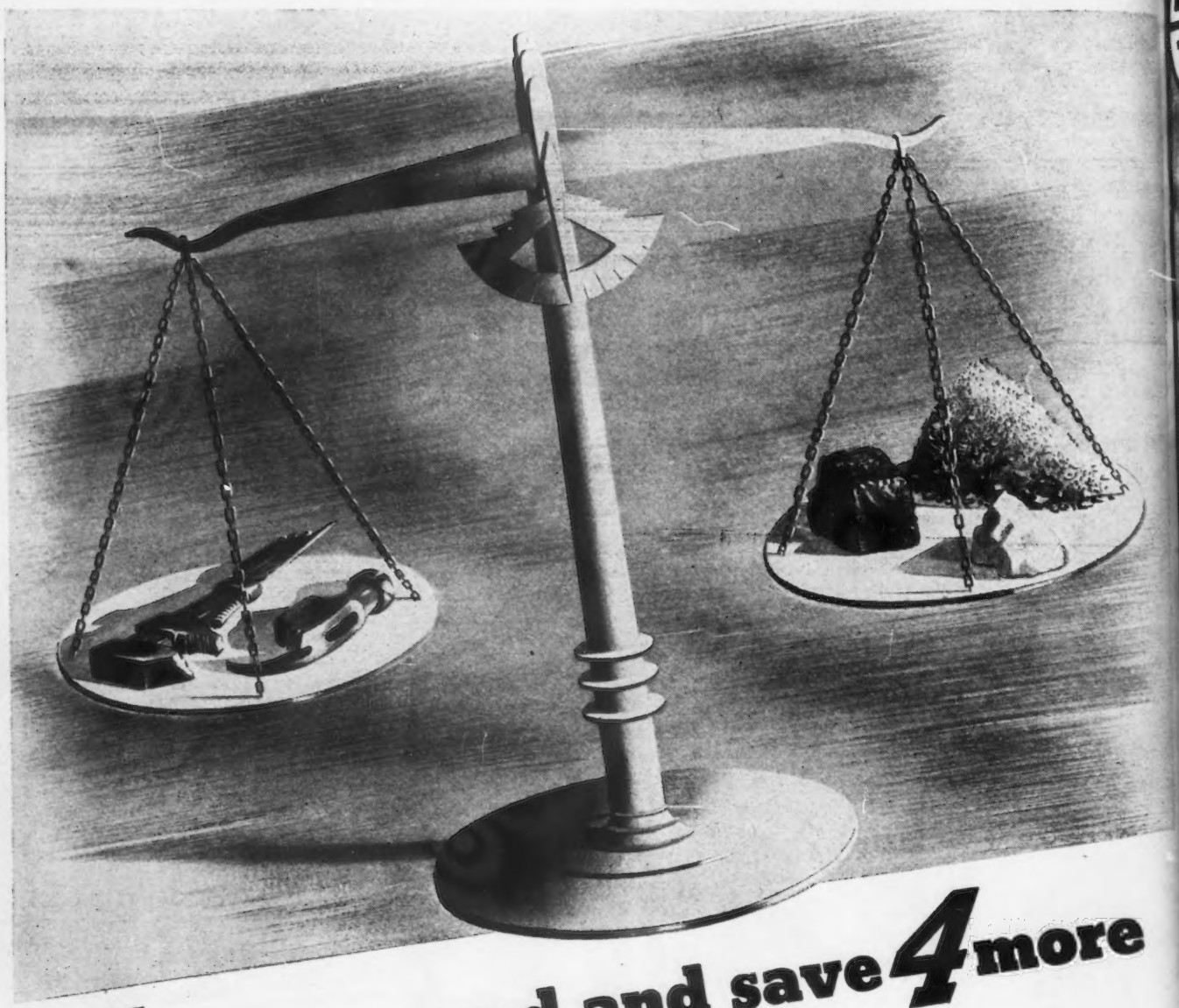
THE WELLMAN SMITH OWEN ENGR. CORP., LTD. LONDON, ENGLAND

FLINN & DREFFEIN CO. CHICAGO, ILL.

THE HALLDEN MACHINE CO. THOMASTON, CONN.

THE WEAN ENGINEERING CO. OF CANADA, LTD. HAMILTON, ONT.

SPECIALISTS IN SHEET, TIN AND STRIP MILL EQUIPMENT



Scrap a pound and save 4 more

EACH pound of scrap used in making war steel replaces a pound of pig iron.

To make one pound of iron requires nearly four pounds of ore, coal and limestone.

So when you turn in a pound of scrap you also conserve four pounds of vital raw materials. Translate this saving into terms of the 6,000,000 tons of steel scrap that the industry needs today. It is the equivalent of:

12,000,000 tons, or 240,000 carloads of iron ore,

7,200,000 tons, or 144,000 carloads of coal,

3,000,000 tons, or 60,000 carloads of limestone.

Think also of saving the millions of man hours of labor involved in mining, transporting and processing these 444,000 carloads of raw materials — enough to form a solid train stretching from Boston to San Francisco.

The more dormant scrap YOU salvage, the greater the amount of America's materials, machines and manpower is released for the all-important task of winning the war now.

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

THROW YOUR SCRAP INTO THE FIGHT — YOUNGSTOWN

THIS ADVERTISEMENT SPONSORED BY

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Youngstown, Ohio

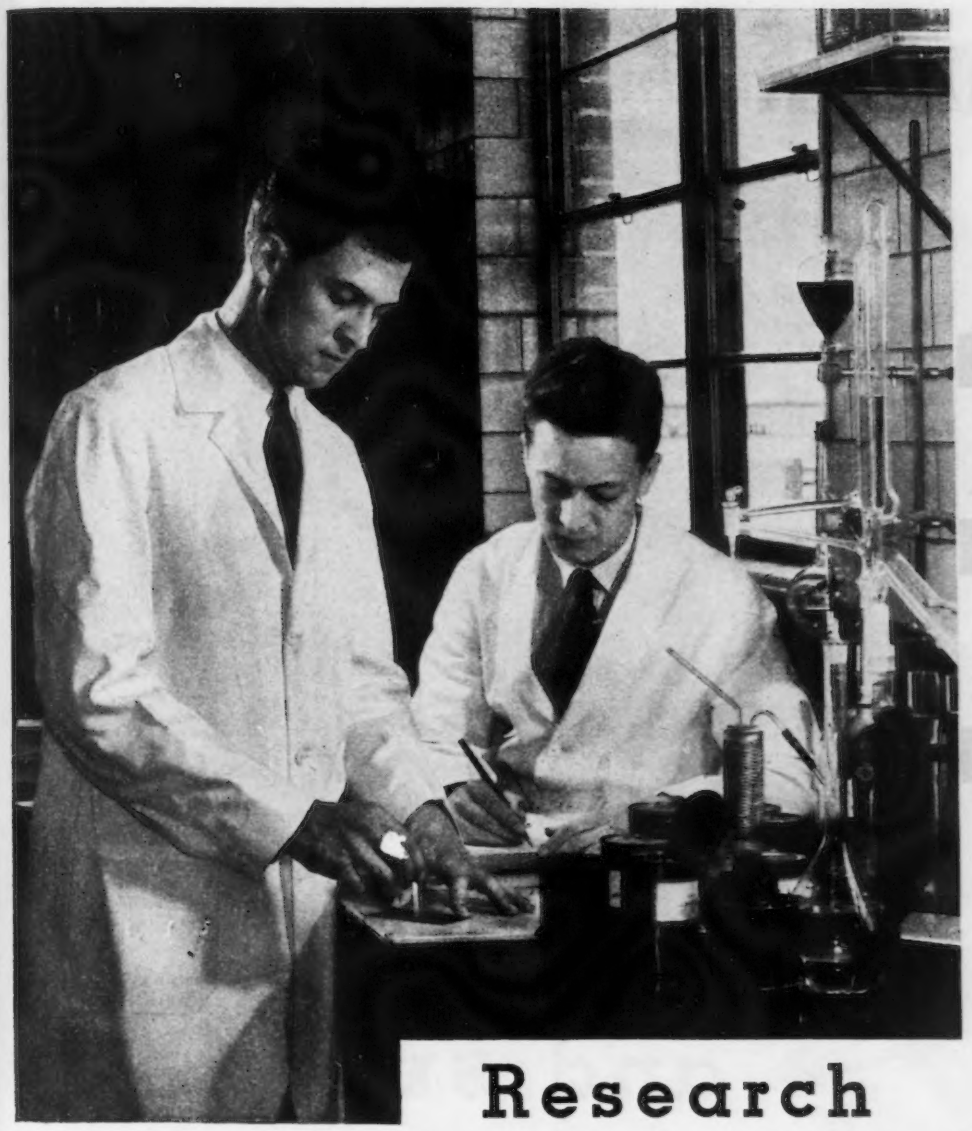
25-43E

MESTA 21"—18"—14"—10" MERCHANT MILLS,
WITH PACK ANNEALING COOLING BED AND EQUIPMENT

MESTA MERCHANT MILLS

The Army-Navy "E" Flag with four stars, flies over the Mesta Plant.

MESTA MACHINE COMPANY · PITTSBURGH, PA.



PARCO LUBRIZING

Parco Lubrizing is a chemical treatment for iron or steel friction surfaces, in mechanical assemblies, that improves bearing properties, and retards wear.

BONDERIZING

Bonderizing is a chemical treatment for iron, steel, or zinc that insures cohesion of applied coatings of paint, enamel or lacquer, resulting in longer-lived, rust-resistant finish.

PARKERIZING

Parkerizing is a chemical treatment for iron or steel, resulting in a surface that can be stained, oiled, waxed or painted and is substantially resistant to rust.

Research
Developed Bonderized Steel For Cans
A New Material for Food Packaging

For over a quarter of a century practical developments in the art of protecting iron and steel from rust have come from the Parker Research Laboratories in a steady stream. Each new improvement has meant more service to the consumer—in most cases at lower cost. Each year more and more money, time, and effort have been poured back into research to make iron and steel serve man better, and more economically by protecting them from rust.

Parker products and processes are protecting millions of items and parts of military equipment—and by so doing are rendering important war service—yet the development of Bonderized steel for the manufacture of cans, closures and containers comes as an outstanding new and valuable Parker achievement.

Canned food is of vital importance in both military and civilian life. It is one of our critical problems and the Bonderized steel can is contributing toward its solution. For months American steel mills have been producing Bonderized sheet steel for the can and container industry. The research departments of leading can and steel manufacturers have contributed substantially to this development and research still goes on to improve the product, technique of use and extend its utility.

War's end will release Bonderized sheet steel for use in a multitude of products where greater ease of fabrication, greater endurance in service will be vital *selling* factors!

PARKER RUST PROOF COMPANY, 2186 E. MILWAUKEE, DETROIT 11, MICHIGAN

PARKER PRODUCTS CONQUER RUST

They ADD...

and subtract FIGURES!

Punch buttons or push pedals — springs are there to make it easier to do. Many of the usual jobs for springs are now war jobs—with more than ordinary service required. Where engineering knowledge has been applied to spring design, this extra duty is faithfully absorbed. Because it is sometimes hard to know when a mechanism must undergo unusual conditions of corrosion or heat and cold, it is well to pay particular attention to the selection of the spring that makes it go. Springs must stay alive, if mechanisms are to last.

Barnes-made Springs

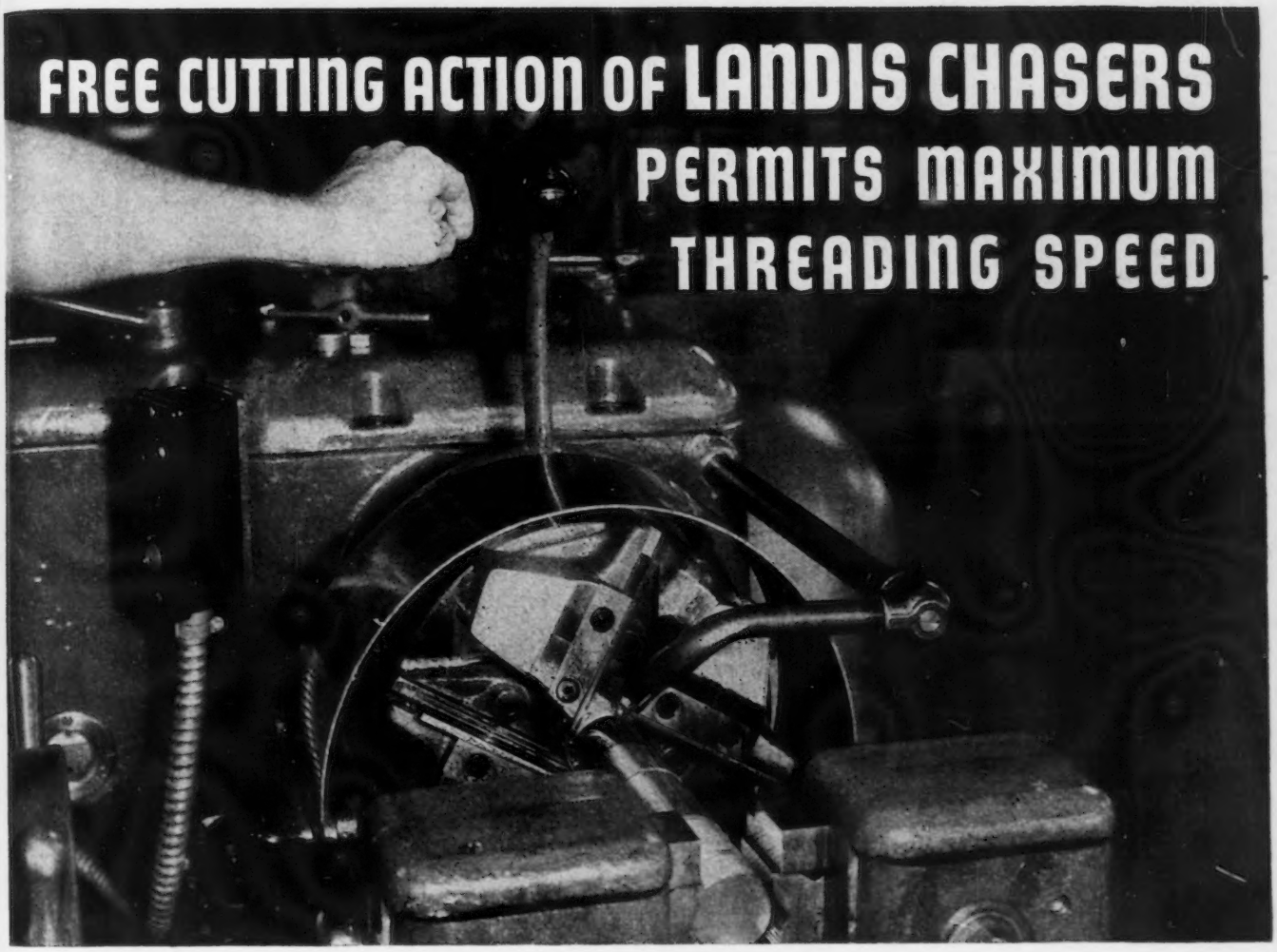
ENGINEERED PEP AND POWER

WALLACE BARNES COMPANY

DIVISION OF THE ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT

FREE CUTTING ACTION OF LANDIS CHASERS PERMITS MAXIMUM THREADING SPEED



The natural cutting clearance obtained by the tangential position of the chaser with the work assures a freer cutting action which permits the use of higher cutting speeds.

Since the Landis Tangential chaser has only a theoretical line of contact with the work, friction is considerably lessened and even with the highest threading speeds the possibility of thread distortion is reduced to a minimum.

The Finest Thread Cutting Tool in Industry

12 Features of the LANDIS TANGENTIAL CHASER

1–Permanent throat permits close to shoulder threading throughout life of chasers
2–Rake angle range covers all machinable materials
3–Free cutting condition permits maximum cutting speeds
4–Simple grinding operation renews entire cutting edge and leading feature
5–Line contact with work lessens friction and minimizes thread distortion
6–Leading feature insures thread of accurate lead
7–Lateral absorption of cutting strain reduces vibration and chaser breakage
8–Right and lefthand threading feature reduces chaser equipment
9–Standard chasers thread all diameters with proper chaser holders
10–Interchangeability of chasers lowers operating cost
11–Chaser length provides exceptionally long life and low tool cost
12–Permanent throat gives equal distribution of cut

LANDIS
MACHINE COMPANY
WAYNESBORO, PA., U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

Electromet Tungsten

IS SUPPLIED IN THESE FORMS

Electromet Tungsten Powder, containing a minimum of 99 per cent Tungsten. It is available in particle sizes to meet usual industrial requirements.

Electromet Ferrotungsten, containing from 70 to 82 per cent Tungsten. It is supplied in suitable crushed sizes for steelmaking.

Electromet Calcium Tungstate of high purity, now available for use in place of natural ores. It contains a minimum of 50 per cent Tungsten and is available in small briquet or nugget form, packed in bags containing 10 pounds of Tungsten... a convenient form for furnace addition.

BUY UNITED STATES WAR BONDS AND STAMPS

If you have a problem in connection with the use of Tungsten, call on us. Our staff of competent metallurgists are prepared to offer on-the-job assistance in the use of Tungsten and the other Electromet ferro-alloys and alloying metals.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
Trade Mark
Ferro-Alloys & Metals

GETTING A "FIX" ON THE FUTURE

WE'RE getting a "fix" on the future by setting our sights on today's horizons.

In recent years practically every branch of industry has witnessed vast technological changes, many of which have been greatly accelerated by war's unrelenting demands. New vistas have opened—new processes been devised—new products developed. And it has been our privilege to cooperate in the application of Carborundum Brand Super-Refractories to many of the furnaces utilized in conjunction with these processes.

Without interrupting our efforts in filling the refractory requirements of war industries, we find time to discuss plans for the future because we know that tomorrow's problems must be solved today. They cannot be put off until tomorrow for tomorrow would be too late.

Being fully cognizant of this fact many laboratories—many pilot plants—are already working on new and improved materials and equipment for the post-war period. In some of this work refractory problems will undoubtedly arise in the solution of which we would like to lend a hand.

The same technical aid extended to other furnace operators is likewise available to you. Write us today instead of waiting until tomorrow.

REFRACTORY CARBORUNDUM PRODUCTS

THE CARBORUNDUM COMPANY • PERTH AMBOY, N. J.

REG. U. S. PAT. OFF.

Refractory Division

District Sales Branches: Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh. Distributors: McConnell Sales and Engineering Corporation, Birmingham, Ala.; Christy Firebrick Company, St. Louis, Mo.; Harrison & Company, Salt Lake City, Utah; Pacific Abrasive Supply Company, Los Angeles, San Francisco, Calif.; Denver Fire Clay Company, El Paso, Texas; Smith-Sharpe Company, Minneapolis, Minn.

(Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company)

Ol' Red Wabbler says:

"Nironite D Work Rolls in 4-high single stand and tandem cold mills give better finish . . . save roll dollars"

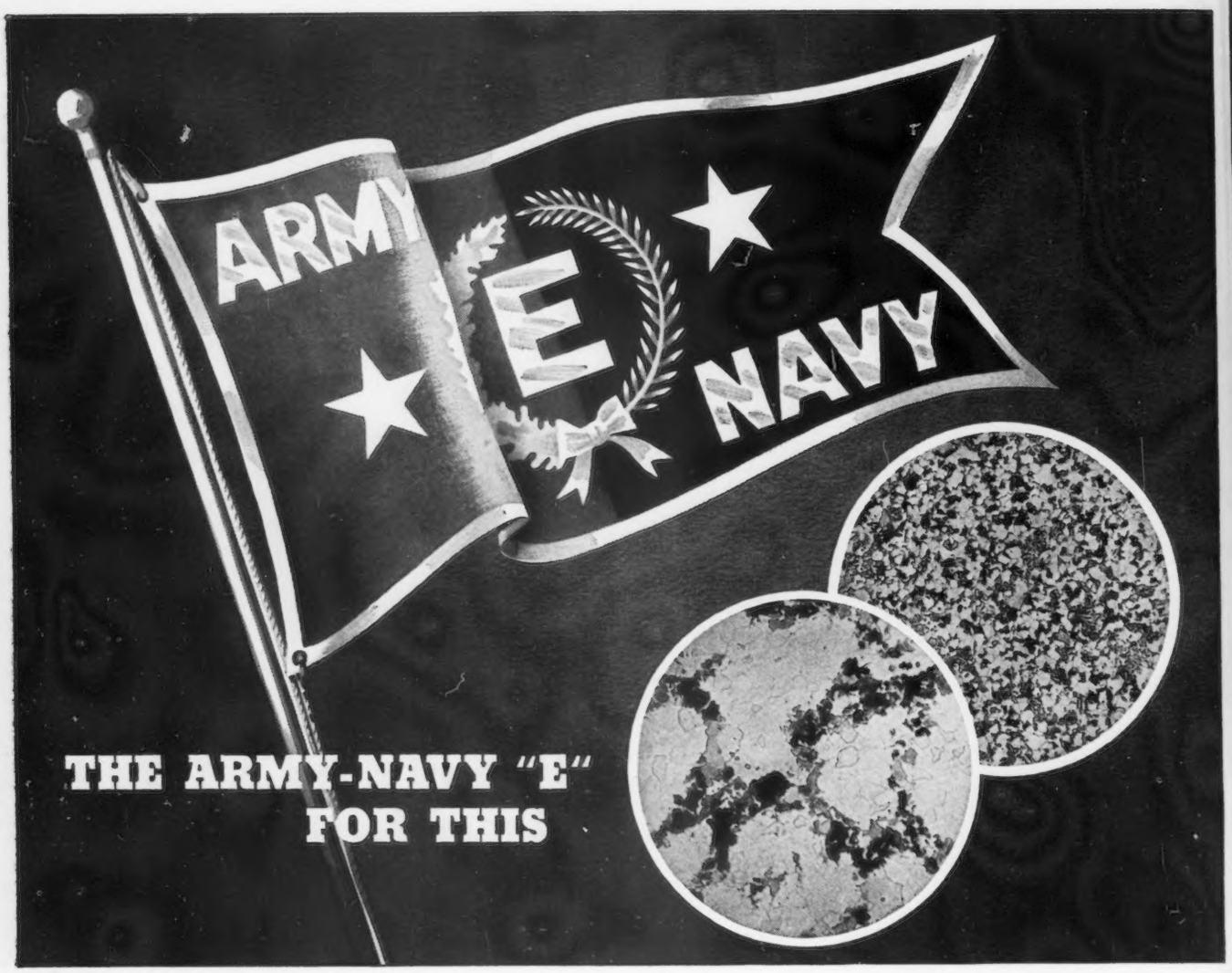
M-H Nironite D Work Rolls for 4-high single stand and tandem cold mills have attained their greatest success in replacing forged and hardened alloy steel rolls, because they have greater resistance to indentation. This means better surface finish for the cold rolled product and a reduction in cost, because M-H Nironite D Rolls stay in the stands longer between roll grinds. These rolls also have a greater hardness penetration and thus can be used down to scrap diameter without being rehardened.

You can get better surface finishes and save roll dollars at the same time. Specify M-H Nironite D Work Rolls for single and tandem cold mills.

Other Mackintosh-Hemphill Products

Rolling Machinery . . . Shape Straighteners . . . Strip Coilers . . . Shears . . . Levellers . . . Pinions . . . Special Equipment . . . Iron-Steel Castings . . . The NEW Abramsen Straightener . . . Improved Johnston Patented Corrugated Cinder Pots and Supports.

MACKINTOSH-HEMPHILL COMPANY • Pittsburgh and Midland, Pa.



On September 5th, 1942, our Mine and Mill at Climax, our Research Laboratory at Detroit and our Conversion Plant at Langeloth, Pennsylvania, were given the Army-Navy Production Award. Since then the award has been twice renewed. The two-starred flag we fly represents a full year of contribution to the war effort recognized by the Army and Navy.

Winning the award by the laboratory began in 1931. It was then that it was founded to meet our needs for authoritative information about molybdenum—containing ferrous materials.

Pearl Harbor intensified our work with producers of war equipment—work that is aided considerably by the accumulated data and experience gained in over ten years of concentrated research.

We are particularly proud to be among those companies whose laboratories are entitled to fly the Army-Navy "E".

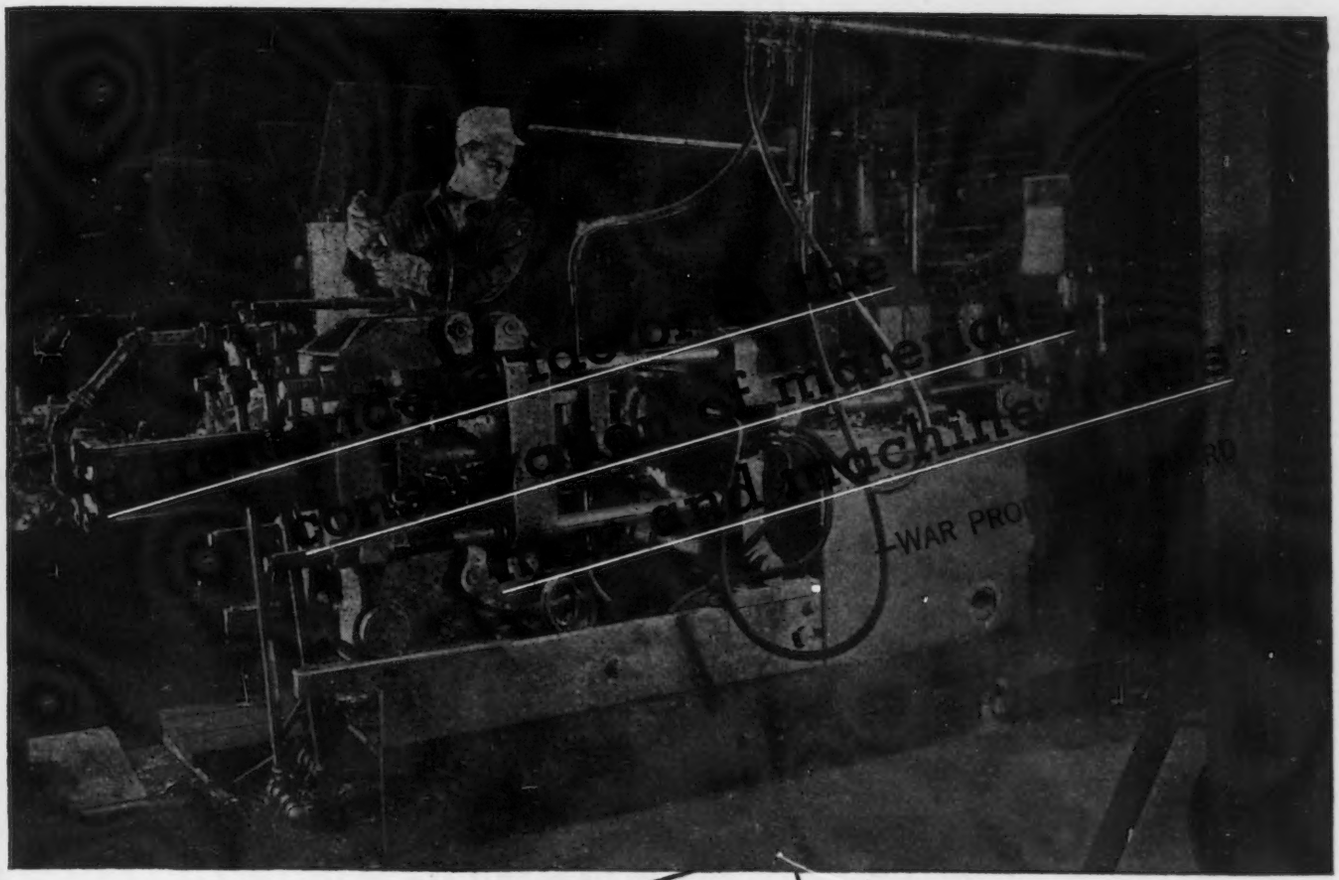
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

MOLY

500 Fifth Avenue · New York City



"We believe that it is quite appropriate at the present time to advocate the increased use of the die casting process. Die casting with its characteristic rapid production and low scrap losses combined with the elimination of costly machining and assembly operations can be a tremendous factor in the conservation of materials, man and machine hours. Although the metals suitable for use in die castings are still relatively critical, the savings in labor to be affected by the use of this process is becoming increasingly important and is playing a larger part in any decision as to the process to be utilized in the production of a given product."

(From a recent W. P. B. letter)

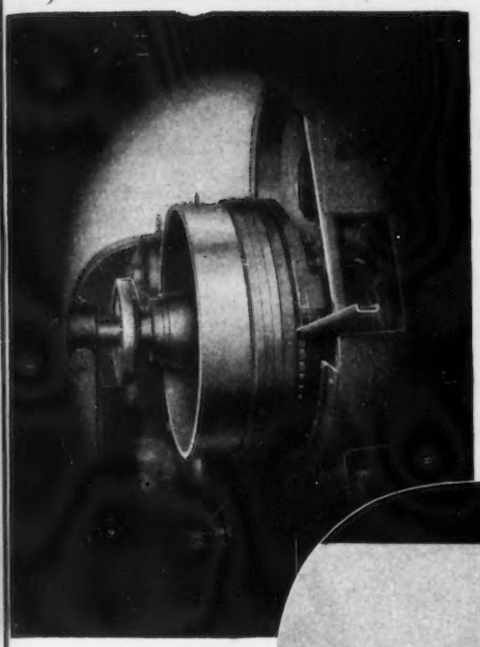
Zinc has been moved from the list of critical materials to the No. 2 list, which means that the supplies at present are sufficient to meet war demands plus essential industrial demands under existing administrative control.

ZINC

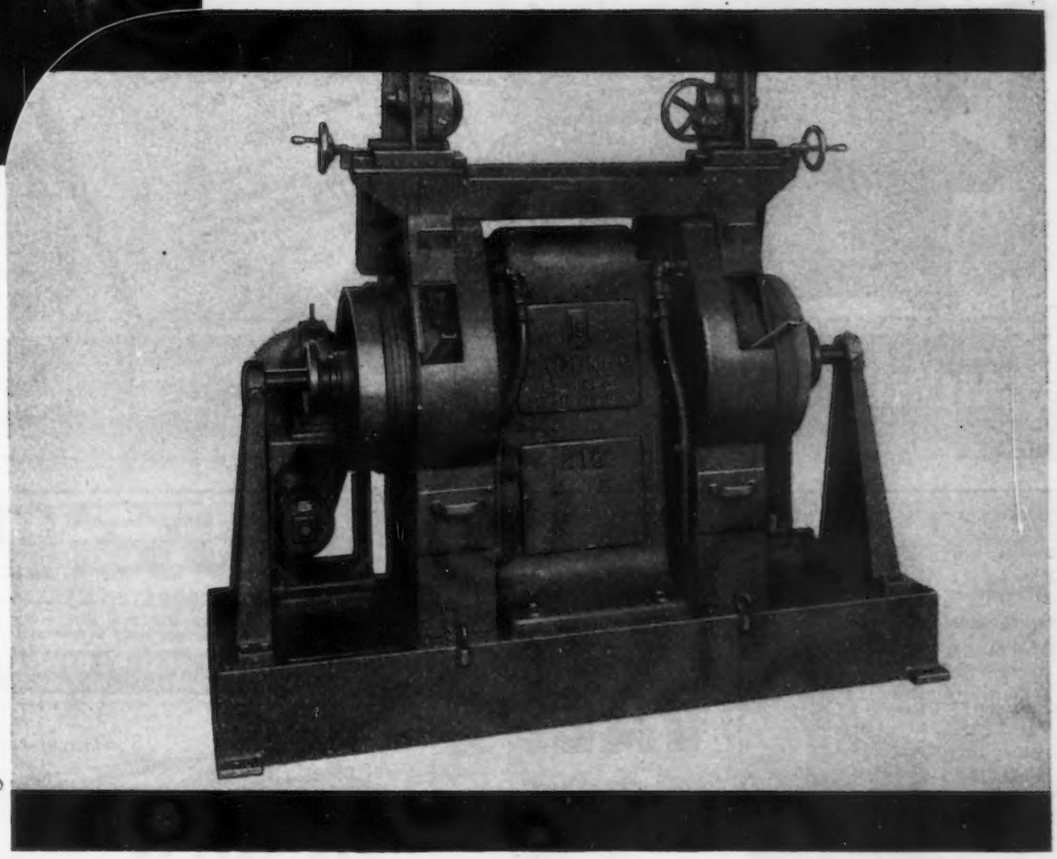
FOR DIE CASTING ALLOYS

ONE OF THE FAMOUS HORSE HEAD ZINC PRODUCTS OF THE NEW JERSEY ZINC COMPANY

160 FRONT STREET, NEW YORK 7, NEW YORK



Bullet cores are ground at 60 to 90 *per minute* on this special GARDNER GRINDER



ANOTHER of the many war jobs on which GARDNER-GRINDING is speeding production, is the bullet cores seen here. A battery of 8 special Gardner No. 218-18" Grinders are turning them out in great quantities in the plant of one of our customers.

The job is to grind a flat on one end of the bullet core, holding to a dimension for length.

TWO rotary work-carriers, one on each end of the machine base, are used. The cores are fed from a chute into notches around the periphery of the work-carrier, the operation being practically automatic.

PRODUCTION: 60 to 90 pieces PER MINUTE, per operator (2 girls employed on each machine). Tolerances: ±.0015" for length, and squareness.

Let GARDNER solve YOUR production problems— WRITE FOR OUR "MODERN METHODS" BOOKLET!

GARDNER - GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

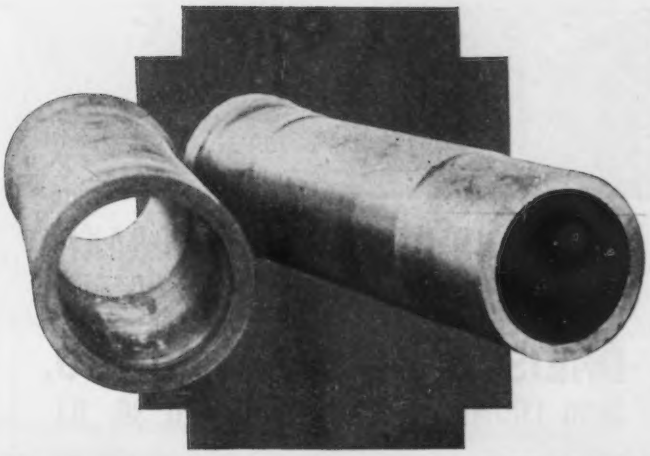
412 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

DARNELL CASTERS

Precision-made Darnell Casters with the DOUBLE BALL-BEARING SWIVEL assure a long life of efficient, economical service

A New **FREE** *Book*

DARNELL CORP. LTD.,
LONG BEACH, CALIFORNIA,
60 WALKER ST., NEW YORK, N.Y.
36 N. CLINTON, CHICAGO, ILL.



PRESSED and HAMMERED FORGINGS

SPINDLES - CYLINDERS - SHAFTS
ROUGH TURNED - HOLLOW BORED

Limited Capacity Available at Present

The COMMERCIAL FORGINGS *Co.*
3700 E. 91 STREET CLEVELAND, OHIO

LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930

Vascoloy RAMET

TANTUNG CUTTING TOOLS — DIES

439

VASCOLOY RAMET CORP. • NORTH CHICAGO, ILLINOIS

CROSBY FOR STAMPINGS

Our engineers are ready and able to help solve your stamping problems, in design or construction. Crosby prices are consistent with QUALITY and SERVICE. In our 46 years of EXPERIENCE we have served over 100 different industries.

Manufacturers of "Ideal" Trolley Wheels

THE CROSBY COMPANY
BUFFALO, N. Y.

WIRE AND METAL RIBBON
FORMING MACHINERY
NILSON TILTING
WIRE REELS
(Wire Reel Catalog No. 51)
Special Machines Designed and Built to Order
THE A. H. NILSON MACHINE COMPANY, BRIDGEPORT, CONN.

GRIFFIN

COLD ROLLED
STRIP STEEL
1/2" TO 19" WIDE
.002" TO .500" THICK
DESIRED QUALITY FOR FORMING AND DRAWING
GRIFFIN MFG. CO.
ERIE PENNA

SALES AGENTS
NEW YORK CITY — Wm. H. Lemort & Co., Inc., 30 Howard St.
PHILADELPHIA—C. B. Tippet, 4308 North Broad St.
CHICAGO—Central Steel & Wire Co., 4545 South Western Blvd.
DETROIT—E. R. Wegener, Boulevard Bldg., 7310 Woodward Ave.
BUFFALO — J. J. Lambert, 325 Huntington Ave.
DAYTON—Central Steel & Wire Co., 1096 East Monument Ave.
SAN FRANCISCO — Charles L. Lewis, 703 Market St.

Immediate Shipments of
BARS-PLATES SHAPES-SHEETS
From Stock

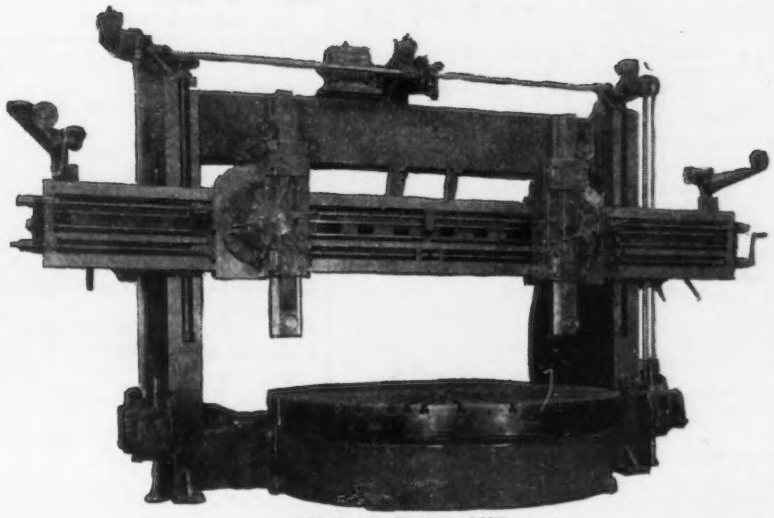
We also offer quick shipments of flame cut plates in irregular shapes, circles, discs, etc.

DAVID SMITH STEEL CO. INC.
234 46th ST. Brooklyn N.Y.

VERTICAL BORING MILLS

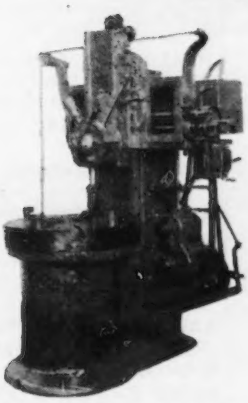
Available for prompt and immediate Delivery from

EMERMAN'S—STOCK

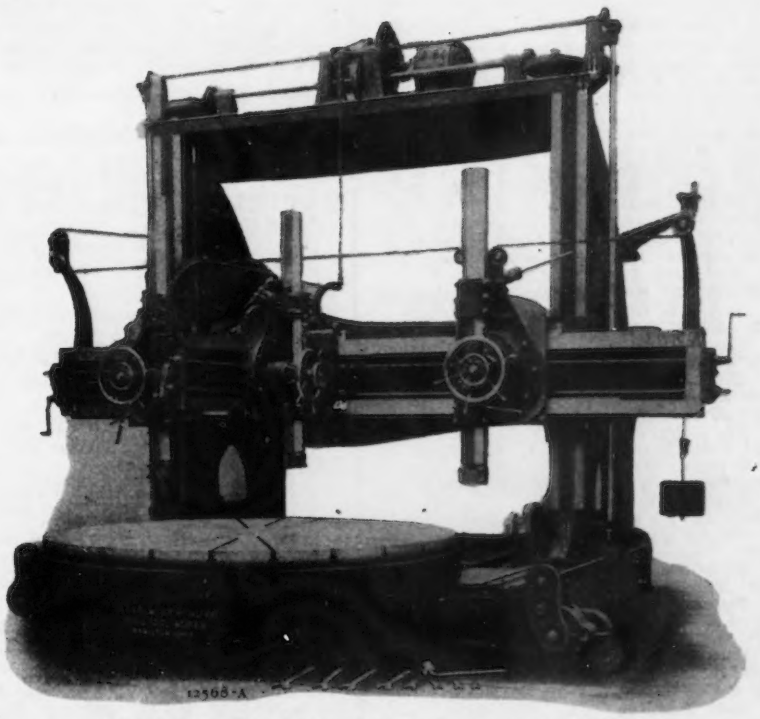


12' Betts Boring Mill

30" Warner & Swasey Boring Mill



30" Rogers Boring Mill



16'-24' Niles-Bement-Pond Extension Type Boring Mill

Also Available

- **10' Pond Boring Mill**
- **51" Niles Boring Mill**
- **48" Bement Miles Wheel Boring Mill**
- **44" Bullard Maxi-Mill.**
- **32" Colburn Boring Mill**
- **24" Bullard Vertical Turret Lathe & Boring Mill**

This selection of Vertical Boring Mills is just one group and type of machines which we have in our large and varied stock. Send us your requirements.

EMERMAN

MACHINERY

875 W. 120th ST. **CHICAGO 43, ILL.**

THE CLEARING HOUSE

KEEP 'EM RUNNING!

Every machine listed in this column is in our warehouse at press time.

●

53" N.B.P. Vertical Boring Mill, 2 swivel heads, M.D.
4⅝" Bar, N.B.P. Horizontal Boring Mill, Knee Type, 30"x90" table, M.D.
#0 FOSDICK Horizontal Boring, Drilling & Milling Machine, M.D.
ROCKFORD Horizontal Drilling & Boring Machine 3⅜" spindle
4' HAMMOND Hi-Speed Sensitive Radial Drill, M.D.
90" PRATT-WHITNEY Spur Gear Cutter
15" GLEASON Bevel Gear Generator
16" BILGRIM Gear Generator
14"x5' PRENTICE Portable G.H. Lathe
42" PUTNAM Double End Car Wheel Lathe, M.D.
PUTNAM Double End Axle Turning Lathe
#1 N.B.P. Car Wheel Lathe
#3-B MILWAUKEE Plain Miller
#2 CLEVELAND Plain Miller
#10 NILES Vertical Milling Machines
#6 BECKER Vertical Milling Machine
30"x30"10' NEWTON Slab Miller
12" Wm. SELLERS Slotters
20" SELLERS Crank Slotter, M.D.
20" MILWAUKEE Heavy Duty BG Crank Shaper, M.D.
24" GOULD-EBERHARDT BG Crank Shaper, M.D.
6"x6" RACINE Power Hack Saw, M.D.
12"x12" ACME Power Hack Saw, M.D.
48"x48"x24' N.B.P. Heavy Planer, Two Rail, One Side Head, M.D.
48"x48"x20' PATCH Planer, 4 heads, 230 volt D.C. Rev. M.D.
36"x36"x8' GRAY Planer, 230 volt D.C. Reversing M.D.
24"x24"x6' WHITCOMB Planer, 230 volt D.C. Reversing M.D.
36" Rotary Planer, M.D. Turntable
#3 WARNER-SWASEY Turret Lathes, 3⅛" bar capacity
#1 L&A Multiple Punch, 100 Tons, 72" between housings
6"x6"x⅝" SOUTHWARK Double Angle Shear
SCHULTZ - NAUMANN Beam Shear, 20", 60 lb. and smaller
60" Throat, 8"x1 1/16" LONG & ALSTATER Shear
54" Throat 1¾"x1⅛" HILLES & JONES Punch
4" LANDIS Pipe Threading Machine
6" BIGNALL - KEELER Duplex Pipe Machine
10" Standard Pipe Threading Machine
4" BAKER Heavy Duty Automatic Tapping Machine
#0 BAKER Keyseater, M.D.

SIMMONS ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORP.
1721 North Broadway, Albany 1, N. Y.
N. Y. Office: 149 Broadway

FROM STOCK

TURRET LATHES
#1 B FOSTER, geared head, universal.
#4 WARNER & SWASEY—1½" capacity.
LATHES
36" x 12' DRAPER, Belt Drive.
32" x 12' PITTSBURGH, Quick Change, M.D.
24" x 10' BOYE and EMMES, D.B.G., taper.
20" x 22" REED PRENTICE, geared head, late model, taper.
18" x 8' SIDNEY Q.C., D.B.G., M.D.
18" x 8' HENDY (Tie Bar)
16" x 8' LeBLOND, Q.C., Drop levers.
16" x 8' MONARCH, Q.C., D.B.G.
16" x 6' PRATT and WHITNEY, P.C., pan
15" x 8' SIDNEY Q.C., 17" swing.
12" x 6' HENDY, Q.C. (Tie bar)
MILLING MACHINES
#2 ROCKFORD plain, heavy duty, M.D.
#2 VAN NORMAN plain, duplex.
#2 MILWAUKEE, Universal.
#1½ BROWN and SHARPE, univ. M.D.
#0 BROWN and SHARPE, plain.
#0 BICKETT, plain.
SHAPERS
21" SMITH and MILLS, motorized.
DRILLS
7' DRESSES radial, universal, 17" col. M.D.
4' BICKFORD radial, univ., 11" col., M.D.
5' NILES radial, round col., swivel head.
25" BARNES upright.
21" CINCINNATI upright, Motor Drive.
GRINDERS
#2 BROWN and SHARPE universal, cyl., Excello internal grinding spindle.
#12 BROWN and Sharpe univ. Tool & cutter.
#2 DIAMOND surface grinder.
#65 HEALD internal, self contained.
8" WILMARTH and MARMON hand surface grinder. Yankee drill grinder, belt drive.
WILMARTH and MARMON die chaser grinder.
BESLY, 30" horizontal disc, 15 H.P.
#1 BESLY, disc.
PLANERS
36"x36"x10' GRAY, heavy, 3 heads.
30"x30"x8' GRAY, 2 heads.
BORING MILLS
42" PUTMAN, 2 heads, rapid traverse. Thread & Spiral Attachment.
PIPE and BOLT MACHINES
1½" ACME Bolt Cutter, Landis head
2" LANDIS, Pipe.
2" LANDIS, Pipe, motor drive.
#521 OSTER, Bolt Threader, 1¼".
MISCELLANEOUS
#2 MITTS and MERRILL Keyway cutter.
#4 BROWN and SHARPE Gr. Gutter, 36" x10".
ALLEN Pneumatic Riveter, 1" Rivets.
½" RYERSON rotary bevel shear.
24" BEMENT single end punch, Arch jaw.
#1100 NILES single frame steam hammer.
KELLER die engraver, six spindles.
MOTOR GENERATOR SETS
1—250 K.W. General Electric MPC., 250 volt, 1200 R.P.M. 400 HP. Synchronous 3/60/2300/1200 R.P.M.
1—200 K.W. Cr. Wh. 250 volt, Synchronous 3/60/2300/900 R.P.M.
1—50 K.W. G. E., 125 volt, 3/60/2300/720 R.P.M.

Everything from a Pulley to a Powerhouse

THE O'BRIEN MACHINERY CO.
Philadelphia's Largest Machinery Dealers and Exporters
113 NORTH 3rd STREET, PHILADELPHIA 6, PA.
Warehouses and Shops—2820 East Tioga Street
1224 N. Front Street—5334 Haverford Avenue
Bell Telephone: Market 4180 Cable Address: O'Brien Phila.

MOREY
Dependable Used Machines

N.B.P. 96"x96"x16' Planer; 4 heads; DC variable speed M.D.; box table
N.B.P. 48"x36"x14' Planer; 3 heads; box table; belt drive
GRAY 24"x24"x6' Single Head Planer
LUCAS #31, 3" bar Horiz. Boring Mill—M. D.
LUCAS 3" bar Horiz. Boring Mill—Belted M.D.
LUCAS #3, 3½" bar Horiz. Boring Mill—Belted M.D.
D.&H. 5" bar Horiz. Boring Mill—Floor Type
N.B.P. 38-44" Vert. Boring Mill; side head
CINCINNATI #3 Vert. Miller; Timken bearing
K.&T. #2B, #3B Plain Millers
CINCINNATI BICKFORD 6' Pl. Radial Drill; M.D.
NATCO C-13 Hyd. Multiple Spindle Drill
NORTON 15"x15"x72" Openside Surface Grinder
LANDIS 20"x220" Plain Grinder; M.D.
LANDIS #3½ Int. Hydraulic Race Grinder
BLANCHARD #16 Rotary Surface Grinder; M.D.
HEALD #25A Rotary Surface Grinder
HEALD #60 Internal Grinder; M.D.
RIVETT Internal Grinder; latest type
GLEASON 6"-18" Bevel Gear Generators
BILTON (Standard) No. 35G Gear Miller
J.&L. 3x36" Steel Head Turret Lathe
AMERICAN 24x12' Geared Head Lathe; Timken Bearing
ESPEN LUCAS No. 138 Cold Saw—Cap. 12"
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancing Machine
LONG & ALLSTATTER Double Angle Shears
CLEVELAND Model B Auto. Screw Machine—Cap. 1½"
POTTER & JOHNSTON No. 6C Semi-Automatic
100 Ton. Horiz. Hydraulic Forcing Press
CINCINNATI Gear Burnisher; M.D.

100 ASSORTED MILLING MACHINE ATTACHMENTS
DIVIDING HEADS
Vertical — Slotting — Rack Cutting

THIS IS A PARTIAL LIST
Send us your specific inquiries

MOREY MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

THE CLEARING HOUSE

CONSIDER GOOD USED EQUIPMENT FIRST

AIR COMPRESSOR
1500 cu. ft. 22" and 12"x14" Sullivan, Class WN-31, M.D. 150# Pressure

BALER
Type 14-P-72 Logemann Double Scrap Baler, Boxes 2'6"x6'18". Size of Bale 18"x18"x18". Complete with Pump, Motors and Air Compressor

BORING MILLS—HORIZONTAL
10" Bar Niles Cylinder Boring Machine, B.D. Distance between end of main boring bar and tail bearing 10'

BRAKES—PRESS TYPE
10'6" Ohl Press Brake, B.M.D. #11 Gauge
12'6" Ohl Press Brake, B.M.D. #10 Gauge

BUCKET
¾ Yd. Blaw-Knox #311 Single Line Type Clam Shell Bucket

BUILDING & CRANE
45'x180' Steel Building, Including 10 ton Whiting OET Crane, 45' Span, three 220 volt D.C. Motors

BULLDOZERS
No. 3 Williams & White, Face of Crosshead 39"x7", Stroke 18"
No. 6 Williams & White, Face of Crosshead 63"x12", Stroke 20"
No. 7 Williams & White, Face of Crosshead 54"x16", Stroke 5"

CRANES—OVERHEAD ELECTRIC TRAVELING

2 ton Calumet	38'6" Span.	230 Volt D.C.
5 ton Shaw	9'6" Span.	220/3/60 A.C.
3 ton Shepard	35'4" Span.	110 Volt D.C.
6 ton Northern	45" Span.	220 Volt D.C.
7½ ton Shepard	36' Span.	220 Volt D.C.
7½ ton OET	38' Span.	220 Volt D.C.
10 ton Northern	50' Span.	220 Volt D.C.
20 ton Niles	33' Span.	220 Volt D.C.
20 ton Morgan	60' Span.	220 Volt D.C.
5 ton Auxiliary		
75 ton Morgan	60' Span.	220 Volt D.C.
With 15 ton Auxiliary Hoist		

CRANE—GANTRY
5 ton Cleveland 40' Span Bucket Handling Crane, 44' Bridge Extension which raises and lowers. Complete with five 220 V DC Motors

CRANE—RUNWAY
780 Ft. Steel Runway—"A" Frame Construction
175 Ft. Steel Runway—"A" Frame Construction

NILES-BEMENT-POND GUILLOTINE SHEAR, A.C. motor driven, capacity 3" to 3½" round.

1500# Chambersburg Steam Drop Hammer
Including Extra Spare Parts
1 Set New Uncut Dies
Oil Fired Forge Furnace

#5 QUICKWORK ROTARY SHEAR
Belted Motor Drive
Capacity ½"
Circle Cutting Attachment

800 TON MESTA STEAM HYDRAULIC FOUR COLUMN FORGING PRESS
Distance Between Columns R to L x F to B 6'x2'9"
Maximum Opening under Top Platen ..... 7'2½"
Maximum Opening Between Upper Face of Lower Die Block and Lower Face of Upper Die Block ..... 40"

DIEING MACHINES
25 ton Henry & Wright ¾" Stroke. Equipped with double Roll Feed
75 ton Henry & Wright Automatic Die Machine. Equipped with double Roll Feed

FORGING MACHINES
Ajax, National, Acme—Various Sizes

FURNACE
8 ton Swindell Electric Melting Furnace. Complete with Transformer

HAMMERS—STEAM DROP & STEAM FORGING
600# to 8000# Chambersburg, Erie, Niles-Bement-Pond, Morgan & Massillon, Single & Dble. Frame

LOCOMOTIVE
16 ton Vulcan Locomotive, Gasoline Engine Driven. Six Cylinders 5⅛" Bore, 7" Stroke. Track Gauge 4'8½"

MILLING MACHINE
Ingersoll Planer Type Milling Machine. Two heads on rail and One head on Each Housing—Distance bet. housings 44". Table 42" wide, 18' long

PLANER—ROTARY
Espen-Lucas Column Facer, Arr. M.D. Cutter Head 30" dia. Table 35"x28"

PUMPS
4"x6" Gould Triplex. T & L Pulley Drive. 50 G.P.M. at 150 lbs. Pressure
4"x8" Gould Triplex. T & L Pulley Drive. 80 G.P.M. at 200 lbs. Pressure
4"x12" Deane Horizontal Hydraulic Duplex. Arranged for Motor Drive. 150 G.P.M. at 1500 lbs. Pressure
2"x12" Deane Double Acting Hydraulic, 46 G.P.M. at 4500 lbs. Pressure

PUNCH—MULTIPLE
#2 Cleveland Multiple Punch, B.D. 6'2" Between Housings. 125 tons Pressure

PUNCH & SHEAR COMBINATIONS
#206 Morgan 14½" Throat, Single End, Arr. M.D. Capacity 2¼" Thru 1½"
36' Throat Cleveland Style "EF" Punch & Shear. Single End. Cap. Punch 1" thru 1¼". Shear 1" Attachments for Punching, Shearing, Angle Shearing and Plate Bending
48" Throat Cleveland Style EF, Rated Cap. Punch 1¼" thru 1"

ROLLING MILLS
7"x5½" Blake & Johnson Single Stand Two High
8"x8" Standard Mche Co. Single Stand Two High
8"x5" Broden Single Stand Two High
10"x14" Waterbury Farrel Single Stand Two High
14"x15" Hoagland Single Stand Two High
14"x19" Waterbury Farrel Single Stand Two High
12" Merchant Mill—Three High
30" United Engr & Fdry Co Sheet Bar Mill Three High

ROLLS—PLATE STRAIGHTENING
24" Hilles & Jones #2 Plate Straightening Roll. Six 10" Dia. Rolls. Arr. M.D. Capacity 1" thick mild steel plates, 24" wide, or equiv. duty
6" Hilles & Jones #2 Plate Straightening Roll. Six 10" Dia. Rolls ½" Cap.

SHEARS—ALLIGATOR
No. 7 United Engr. & Fdry. Co. Alligator Shear. Arr. M.D. Capacity 6" Square
No. 6R United Engr. & Fdry. Co. Alligator Shear. B.D. Approx. Capacity 6".
20" Lewis Alligator Shear, B.D. Capacity 2¾" square billets or plates 1½"x8"

STRAIGHTENERS
⅜" Shuster Straightener, 12' cut-off, Belted Motor Drive.
Five Roll Waterbury Farrel Straightening Machine Rolls 3" Dia. x 16" Face. Arr. Motor Drive

Pittsburgh Office
1227 Park Bldg.

• Manufacturing **RITTERBUSH & COMPANY, INC.** Equipment •

30 CHURCH ST., NEW YORK CITY, 8
Telephone Cortlandt 7-3437-3438

Pittsburgh Phone
Atlantic 6430

Confidential Certified Appraisals
Liquidations—Bona Fide Auction Sales Arranged

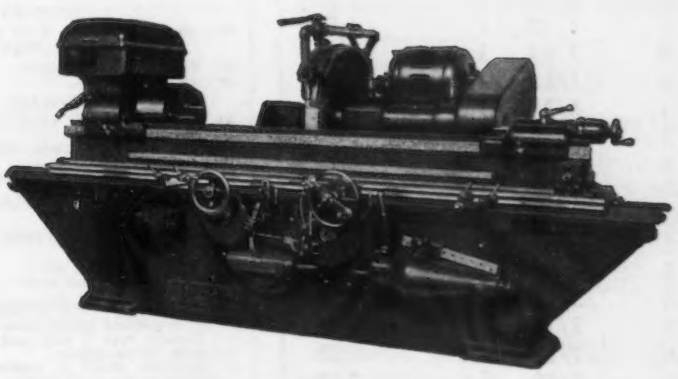
Consulting Engineering Service
Surplus Mfg. Equipment Inventories Purchased

HILL-CLARKE *MODERNIZED MOTOR-DRIVEN* GRINDERS

***featuring the* HILL-CLARKE MULTIPLE V-BELT WORK HEAD AND SUPER-GRINDING FOR MICRO-FINISH**

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."



SIZES AVAILABLE

10 x 36	10 x 72	14 x 72	16 x 72
10 x 50	14 x 50	14 x 96	18 x 96

Have you any NORTON Grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO. CHICAGO U.S.A.

HILL-CLARKE MACHINERY CO.

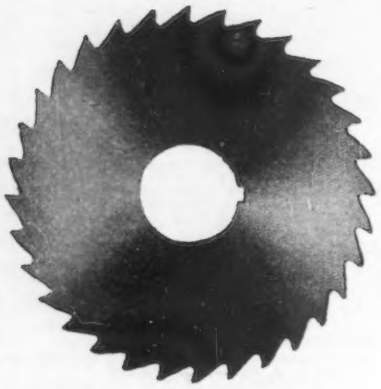
647 WASHINGTON BOULEVARD, CHICAGO, ILL.

THE CLEARING HOUSE

PROMPT DELIVERY

NEW

HIGH SPEED SLITTING SAWS



THESE SAWS ARE HOLLOW GROUND

Dia.	Width	Hole	Our Price Net Each High Speed
2½	1/32	⅞	$1.68
2½	3/64	⅞	1.68
2½	1/16	⅞	1.68
2½	3/32	⅞	1.68
2½	⅛	⅞	1.68
3	1/32	1	1.98
3	3/64	1	1.98
3	1/16	1	2.04
3	3/32	1	2.04
3	⅛	1	2.10
3	5/32	1	2.20
4	1/32	1	2.58
4	3/64	1	2.64
4	1/16	1	2.70
4	3/32	1	2.82
4	⅛	1	3.00
4	5/32	1	3.12
4	3/16	1	3.30
5	1/16	1	3.48
5	3/32	1	3.78
5	⅛	1—1¼	3.96
5	5/32	1—1¼	4.20
5	3/16	1—1¼	4.44
6	1/16	1	4.38
6	3/32	1	5.02
6	⅛	1—1¼	5.16
6	3/16	1—1¼	6.24
8	1/16	1	10.00
8	⅛	1—1¼	10.50
8	3/16	1—1¼	11.88

VICTOR

MACHINERY EXCHANGE, INC.

251 Centre St., New York, N. Y.

Phone: CAnal 6-5575

QUALITY TOOLS

AUTOMATICS

14"x19" Fay automatic lathe
1" Cleveland Model J double end
1⅝", No. 55 National Acme with tapping attachment
4½" Gridley Model H chucker
7" Baird 6 spindle chucker
No. 16 Gisholt Simplimatics

DRILLS, HEAVY DUTY, MULTIPLE & MISCELLANEOUS

20" Barnes hy. dy., all geared self oiling
20" Barnes No. 20I hy. dy., Mfg. type
30" Rich Tool Co., hy. dy.
No. 11 Natco 12 spindle
No. 12 Natco 8 & 12 spindle
No. C12 Natco 12 spindle
No. 13 Natco, 12 & 18 spindle
No. 16 Natco, 24 spindle, heavy
Rhenberd-Jacobsen 16 spindle production
24" & 30" Henry & Wright type I, sensitive
No. 430 Barnes horizontal duplex

GEAR MACHINERY

No. 16HS Gould & Eberhardt hobbers
10", No. 1 Lees Bradner hobbers
Type ZI Fellows gear shaper
24"x12" Flather auto. spur.
26"x 8" Brown & Sharpe auto. spur
36"x 6" Gould & Eberhardt auto. spur
48"x10" Brown & Sharpe auto. spur
60"x20" No. 5A Cincinnati auto. spur
15" Gleason spiral bevel pinion roughers
15" Gleason spiral bevel gear roughers
18" Gleason bevel testers & lappers
Lipe 2 spindle chamferer
Ingle tooth rounder
Model B National gear cutter checker

GRINDERS

10"x48" Landis type B hydraulic
12"x36" Landis
12"x48" No. 3 Brown & Sharpe universal
12"x48" No. 3 Cincinnati universal
16x36 & 16"x52" Landis
24" No. 84 Gardner opposed-disc grinder
Nos. 50 & 60 Heald cylinder or internal
No. 41 Oliver 1¾" drill grinder

LATHES

8" Sundstrand Stub
1"x18" Pratt & Whitney automatic
3½" & 4"x36" Lo Swing
9"x14" Porter Cable
13"x 6' Automatic threading
Melling crankshaft lathe
24"x16' Shumacher & Boye
36"x16' Putnam geared head

LATHES TURRET

2½", No. 9 Bardons & Oliver
20" Libby universal, 4½" hole, taper attmt.

MILLERS

Type C Hall planetary thread
Taft Pelrse thread miller
Types 10 & 45 Productomatic
No. 1 Davis & Thompson duplex
No. 3 Turnmillers
48" Oesterlein tilted offset
3⅞" bar Beeman & Smith Boring Mill

PLANERS

24"x24"x5' Gray
24"x24"x6' Woodward & Powell
29"x29"x6'3" New Haven

RIVETERS

Nos. 2A hy. dy., 5½ B & 7B High Speed

SHAPERS

16" Milwaukee, Swivel table
36" Morton draw cut

SHEARS

No. 180 Tessmer sprue cutter
1½" Lewis alligator
1¾" No. 1 Hilles & Jones alligator
2" Newbold guillotine
8"x8"x1" Long & Alstatter double angle

SWAGER

No. 6HS Langelier

TAPPERS

Nos. 1 & 2X Garvin
1½" National 6 spdl. nut
Natco one and two way horiz.

THREADERS

¼"x2" Waterbury Farrel thread roller
¾" Economy type R auto. stud threader
1" Landis double spindle
1" Cleveland Model J, double end for threading, drilling, pointing and turning
2" Landis 2 spdl. bolt
2" Rogaco pipe threader

UPSETTERS & FORGING ROLLS

4" Ajax steel frame upsetter
No. 1A Ajax taper forging rolls

MISCELLANEOUS

BENDING BRAKE. 10' Ohl, 255 ton capy.
BROACH, No. 3 dbl. & 4 Lapointe
CENTERER. 5" Whiton single end
HAMMER. 100 lb. Bradley helve
PRESS. No. 53 Toledo straight side
PUNCH. 12" throat, Long & Alst., 1¼"x1" capy.
ROLL. No. R60 Yoder crown fender
SCREW DRIVER. No. 61AA Bodine, Model C Detroit
WASHER. Blakeslee continuous

WRITE FOR STOCK LIST NO. 176

MILES MACHINERY CO.

Saginaw, Mich.

IN STOCK

AUTOMATICS

No. OOG Brown & Sharpe, single spindle
No. OO Brown & Sharpe, single spindle
⅞" Model M Cleveland, four spindle
⅞" Model G Gridley, four spindle
1¾" Gridley Model F, four spindle
9/16" National Acme, No. 515, four spindle
4½" Cleveland, Model A, single spindle
5½" Cleveland, Model A, single spindle

BORING MILLS

148" Betts Vertical, 2 heads
84" Gisholt Vertical, 2 heads
72" Colburn Vertical, 2 heads
60" Bullard Vertical, 2 heads
4" Fosdick Horizontal, Floor Type

BROACHES

H0 American Hydraulic, Horizontal
XB10 Oilgear Hydraulic, Horizontal

DRILLS

24" Colburn, single spindle
Barnes Camelback, single spindle, tapping
No. 17 Foote-Burt, 2 spindle
Avey Sensitive, 3 spindle
Leland-Gifford, Sensitive, P.P., 3 spindle
Barnes Camelback, 4 spindle, 2 tapping
No. 11 Natco, multiple spindle

GEAR CUTTERS

No. 12 Barber Colman
No. 7 Fellows Gear Shaper
30"x10" Maag Gear Shaper
No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

No. 3 Cincinnati Centreless
No. 16 Blanchard, 26" chuck
22"x48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
No. 2 Wilmarth & Marmon Surface
30" Diamond Face, 84" Table Travel
No. 3 Landis Universal
6"x32" Norton Cylindrical
No. 2 Cincinnati Universal Tool & Cutter
No. 70 Heald Internal
No. 3 Bryant Semi-Automatic Hole

LATHES

12"x 5' Hendey, c.d., yoke head
14"x 6' Lodge & Shipley, c.d.
18"x 8' Sebastian, g.h.
18"x8' Greaves & Klusman, g.h.
36"x20' Boye & Emmes, g.h.
8"x60" Fitchburg Lo-Swing, g.h
No. 5x24" Lodge & Shipley Duo-Matic, g.h.

TURRET LATHES

24" Bullard New Era Vertical, m.d.
36" Bullard New Era Vertical, m.d.
42" Bullard New Era Vertical, m.d.
12" Bullard Mult-Au-Matic, six spindle, m.d.
No. 4 Libby Universal Ram Type
No. 4 Warner & Swasey Universal, g.h.
No. 3H Libby Universal, g.h., 10½" hole
18" Libby Universal, g.h.
21" Gisholt Universal, c.d.
26" Libby Universal, g.h.

MILLS

No. 3 Ryerson-Conradson Plain, s.p.d.
No. 12 Brown & Sharpe, c.d.
Briggs Type A, c.d.
No. 3 Knight Vertical, s.p.d.
No. 2 Kempsmith Vertical Maximiller, m.d.
No. 3 Brown & Sharpe Vertical, s.p.d.
Model C Becker Vertical, s.p.d.
4" Pratt & Whitney Spline

MISCELLANEOUS

17" Betts Slotter
Cochrane-Bly Die Filing Machine
Pratt & Whitney Design Profiler
No. P2 Ferracute Press
15 Ton Lucas Forcing Press, m.d.

PLANERS

24"x24"x 8' American, m.d.
38"x38"x12' Niles, m.d.
48"x48"x12' Cincinnati, m.d.
72"x56"x20' Cincinnati Hpyro, m.d.
96"x96"x25' Detrick & Harvey Open-side, m.d.

WRITE, WIRE OR PHONE US

INDIANAPOLIS MACHINERY & SUPPLY CO., Inc.

1959-1969 South Meridian St.

INDIANAPOLIS 6, INDIANA

Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

THE CLEARING HOUSE

72"x48"x24' GRAY PLANER—two hds. on rail reversing motor drive

3" bar UNIVERSAL HORIZONTAL BORING MACHINE

36"x36"x8' CINCINNATI PLANER —one head—arranged constant speed motor drive

18" LIBBY TURRET LATHE—4¼" hole

4-spindle HENRY & WRIGHT BALL BEARING DRILLS (11)

18"x120" Type A NORTON GRINDER completely motorized

24"x36"x10' INGERSOLL HORIZONTAL SPINDLE SLAB MILLING MACHINE

24"x24"x14' INGERSOLL ADJUSTABLE RAIL MILLER one vertical head

32"x37½"x12' INGERSOLL ADJUSTABLE RAIL MILLER two vertical heads

HILL-CLARKE MACHINERY COMPANY
Chicago 6, Illinois
647 Washington Boulevard

GEAR MACHINERY
9" Pratt & Whitney Gear Grinder, M.D.
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper, M.D., 11" dia. Hole
No. 6 Fellows Gear Shaper
Cimatool gear chamfering, M.D.
Lees-Bradner Gear Grinder

TURRET LATHES—AUTOMATICS
No. 4A Warner-Swasey Bar Feed
2L Gisholt Bar Feed—New 1940
3 5/16" Model B—4-Spindle Nat. Acme, M.D.
Goss & DeLeeuw 6"x6¾"
3¼x36 Jones & Lamson, Bar Feed

MISCELLANEOUS
36" Bullard Vert. Tur. Lathe: New 1940
No. 3K Vert. Milwaukee Miller: New 1940
4¼"x12" Pratt & Whitney Thread Millers (2)
36"-48"x12' Cine. Hypro. Planer, 4 Hds., M.D.
36"x36"x8' Woodward & Powell Planer Rev. M.D.
No. 2 Lapointe Broach
21-SA Cochrane-Bly H. S. Saw
No. 171 Bliss Stiles Sprue Cutter
12" Lamb & Nash Type K Slitter
14"x50" Norton Plain Cyl. Grinder
12"-18"x30" Monarch Lathe: New 1939

DRILLS
No. B-16 Natco 20 spindles, M.D.
New Delta Drilling Equipment
No. 2 Avey 2-spindle drills with Aveymatic Feed (2)

WIGGLESWORTH MACHINERY CO.
195 Bent St., Cambridge, Mass.

Detrick & Harvey Vertical Boring Mill, 42" swing, 2 swivel heads, completely overhauled.
#12 Barber-Colman Gear Hobbers.
10x36 Cincinnati Plain Cylindrical Grinder.
#2 Vertical and #4 Plain Cincinnati Millers.
Gisholt Lathes, 6¼" hole, 24" swing, no cross slide.
Rapid Shear for cutting beams, angles, channels, etc.

THE ELYRIA BELTING & MACHINERY CO.
Elyria, Ohio

HYDRAULIC PRESS

1000 ton Hydraulic Press built by R. D. Wood Company, up-moving type, 6 posts, platen 42" x 108", stroke 18", daylight space 36", complete with water tank, high pressure piping, gauges, valves, fittings, accumulator, intensifier, pump, 50 H.P. motor and compensator. Was used on forming propeller blades. A-1 condition.

BORING MILL, 36" Gisholt, S.P.D.
BUFFER, Gardner 4 H.P. 230 volt D.C.
DRILL, 6 Spindle Moline Heavy Hole Hog
GEAR CUTTER, 40" G & E, S.P.D.
GEAR PLANERS, Bevel 36" & 54" Gleason
GRINDER, Vert., Disc No. 29-53" Besley
GRINDER, surface Springfield, 75"x15"
GRINDER, surface Pratt-Whitney, 84"x18"
HAMMER, Steam Forging 1100 lb. N-B-P
KEYSEATER, No. 2 Baker, cap. 18"x2"
MILLER, Plain Hi-Power 3-S Cincinnati
MILLER, Plain Geared Head 3-B B & S
MILLER, Vert. No. 2 Brown & Sharpe, S.P.D.
MILLER, Univ. No. 1-B Milwaukee, S.P.D.
OUTBOARD SUPPORT, 5½" bar Hor. Mill
PLANER, 48"x48"x12' Gray, 4 heads, M.D.
PRESS, D.C., 95-B Tol., 55"x54", 175 tons
PRESS, Toggle, No. 3 Bliss, 50 tons
PUNCH, Chambersburg, 1¼"-1", throat 36"
SHEAR, angles 6"x6"x1" Cleveland, M.D.
SHEAR, Squar. 44"x3/16" American, M.D.
SHEET OILER, 72" Aetna-Standard, M.D.
SLOTTER, Portable 48" Morton, M.D.
STRAIGHTENER, Tube Torrington, ⅛" O.D.
STRAIGHTENER, Plate H & J 84"x¾" hot
STRAIGHTENER, Newbold 48" x 16 ga.
TURRET LATHE, 34" Gisholt, H.S. 4¼"
TURRET LATHE, 3-A W & S, H.S. 3¾", M.D.
TURRET LATHE, 27" Libby, H.S. 7½", M.D.

LANG MACHINERY COMPANY
28th Street & A.V.R.R. Pittsburgh 22, Pa.

SHAPERS
16" Smith & Mills, motorized
26" American, motorized

PLANERS WITH SIDE HEADS
36"x36"x10' Woodward & Powell, 1 cross head, 1 side head, M. D.
36"x36"x12' Pond, 2 cross heads, 1 side head, M.D.
36"x36"x10' Cincinnati, 4 heads, M.D.

GRINDERS
6"x15" Van Norman universal
10"x24" Norton, cylindrical
10"x36" Cincinnati motor.
14"x46" Pratt & Whitney, surface

6 x 18 SURFACE GRINDERS MOTOR IN BASE

GRAHAM MACHINE TOOL CO.
231 CENTRE STREET NEW YORK 13, N. Y.
TEL.: WORTH 4-8125-6

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DeWITT TOOL COMPANY
173 Grand St. New York City

IMMEDIATE DELIVERY
No. 2 Norton Universal Tool & Cutter Grinder—B.D.

KAMIS ENGINEERING CO.
302 Moore St. Phila., Pa.

32" SHAPER
Cincinnati Heavy Duty, Back Geared Crank, V-Ram, Rapid Traverse, Gear box for self-contained motor drive, Large Table & Mould Makers Vise. Latest Model. Stock Shipment.

GALBREATH MACHINERY CO.
306 Empire Bldg. Pittsburgh 22, Pa.

10,000 lb. N.B. Dbl. Frame Steam Forg. Hammer
Single Frame Steam Forg. Hammers—250, 600, 1100, 1500 lbs.
Double Frame 1500 lbs.
Bradley Hammers—all sizes
5" National Heavy Duty Upsetter, steel frame-susp. slides
Upsetting & Forging Machines—¾" to 5"
Single and Double End Punches—wide variety caps. and Throat depths
#2-L La Pointe Horiz. Hydr. Broach
Swaging Machine—#6 Langelier Hydr. Feed—cap. 3"
#H-520 Yoder 5 stand Cold Forming Mills
Tensile Testing Machines 100,000 lb. and 200,000 lb.
Pratt & Whitney 8" Rotary Surf. Grinder
Detroit LFA Rocking Type Electric Furnace —350 lbs.
Wire Straighteners ½", ⅝", ¾
No. 7 Ajax Bulldozer, motor drive
Bolt, Nut & Rivet Machinery

DONAHUE STEEL PRODUCTS CO.
74TH & ASHLAND AVE., CHICAGO 36, ILL.

GRINDERS

50"x28' Norton Roll, M.D.
Norton 12x18", M.D.
Landis 14x52", S.P.D.
Modern 12x48", M.D.
Heald #72A Sizematic, M.D.
B. & S. No. 10, 11, 14
P. & W. 14", 18", B.B.
Hanchett, 10' Face, M.D.
#79 Gardner, 72", M.D.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK 12, N. Y.

PLANERS

Cincinnati 30x30x14' motor drive—2 heads
Cleveland 36x36x8' — open side—2 heads on rail, one side head
Pond 60x60x12'—2 heads
Putnam 24x24x6'

DONAHUE STEEL PRODUCTS CO.
74TH & ASHLAND AVE., CHICAGO 36, ILL.

No. 00 Brown & Sharpe Automatics
4-spindle No. 2 Allen Drill
4-spindle No. 2 Avey Drill
2¼" J & L, Bar and Chucking

D. E. DONY MACHINERY CO.
47 LAURELTON ROAD, ROCHESTER 9, N. Y.

HORIZONTAL BORING MILL
4" Betts Knee Type.
AUTOMATIC
#6A Potter & Johnston; M.D.

SUN MACHINERY COMPANY
36 Van Vechten St., Newark 5, N. J.

QUARRY EQUIPMENT

COMPRESSORS

300 CFM Chi. Pneu with 75 H.P. motor

526 CFM Ingersoll-Rand, Style "JC"

599 CFM Ingersoll-Rand Type 10XB horiz. 2-st. 100 lb. W.P., 150 H.P. 3/60/440 V motor & starter, etc.

888 CFM Ingersoll-Rand Type 10XB horiz. 2-st. 100 lb. W.P., 75 H.P. 3/60/440 V motor and starter, etc.

940 CFM Ingersoll-Rand 10 horiz. 2-st. steam driven with receiver

CRUSHERS

24" x 54" Superior Crushing Rolls
#3 McCully Gyratory
#6 McCully Gyratory

HOISTS

8—American Hoist & Derrick Co. double drum, motor driven with 40 H.P. A.C. motors.

MOTORS

125 H.P. G.E. Type 1-12-125A, 600 RPM, complete with controller, etc.

150 H.P. Allis Chalmers, 695 RPM, complete with controller, etc.

IRON & STEEL PRODUCTS, INC.

13496 S. Brainard Ave., Chicago 33, Illinois

"Anything containing IRON or STEEL"

Motor Driven

BLOWERS

2—#16W ROTO CLONE
with filters
6200 CFM at 2"

1—#12W ROTO CLONE
with filters
3000 CFM at 2"
3 ph. 60 cy. 220/440 Volt
Motors with control

L. J. LAND AND COMPANY

NEW YORK 13, N. Y., 148 Grand St.
READING, PA., 10th and Exeter Sts.

New York City's largest stock Electrical Equipment

ONE YEAR GUARANTEE

We are actively in the market to purchase your surplus or idle electrical machinery.

Over Quarter Century Serving Industry

TURRET LATHES

Warner & Swasey #4, 6, 2A, 3A

Brown & Sharpe #0, 2

Brown & Sharpe Automatics #00, 0, 2G

Libbey 26", 8" hole

CANAL MACHINERY CO.
176 LAFAYETTE STREET NEW YORK 13, N. Y.

COMPLETE

Steam and Electrical Machinery

from

E. I. Du Pont De Nemours & Company's

Carrollville, Wisconsin, Chemical Plant

8—400 H.P. B & W Sterling W. T. Code 200# boilers. Can be shipped in one piece.
1—1000 K.W. G.E. Turbo Bleeder & Condensing Set.
1—2000 C.F.M. Nordberg 2-stage air comp.
2—1000 C.F.M. I-R 2-stage steam driven comp.
2200-K.V.A. G.E. 3-phase transformers, in units of 200-400 K.V.A. each.
Centrifugal motor driven Pumps, 600-4000 GPM
500-Ton Refrigeration Plant in 2-units
12—Steel Buildings Approx. 300,000 sq.ft.

R. W. LYSLE & CO.
Tel. Harrison 5569
Utilities Bldg., CHICAGO

HYDRAULIC EQUIPMENT

Gould 4½x12 Hydr. Pump

600-ton Rapid Action Hydr. forg. press—down moving—48" stroke—2'7½"x5' C to C of 4 columns

1200-ton Hydr. Press — down moving — platen 19 x 10' overall—stroke 66"

2500-ton Hydr. Press—upmoving—4 column—platen 11'8 x 16'6—daylight 9'2—stroke 66"

50-ton HPM 2-column—bed 24" sq.

DONAHUE STEEL PRODUCTS CO.
74TH & ASHLAND AVE., CHICAGO 36, ILL.

IMMEDIATE DELIVERY

No. C-Becker Vertical Milling Machine—M.D.

KAMIS ENGINEERING CO.
302 Moore St. Phila., Pa.

FOR SALE

1—2½" AJAX UPSETTER, with 220-3-60 motor, single belt drive, with all safety guards, ready to operate. Located near Boston, Mass.

ADDRESS: BOX B-108
Care *The Iron Age*, 100 E. 42nd St., New York 17

FOR SALE

MULTIPLE SPOT WELDER

Equipped with Westinghouse Weld-O-Trol
Hydraulically operated
Booster Transformer
Makes 20 Welds per stroke

ADDRESS BOX B-113
Care *The Iron Age*, 100 E. 42nd St., New York 17

FOR SALE

3/16 In. 10 Ft. Power Squaring Shear

W. R. COX STEEL CO.
Virginia 0166 3760 W. 38th St., Chicago

---

2 EVANS VARIABLE SPEED CONE DRIVES
1 STEPHENS ADAMSON BELT CONVEYOR
18" Rubber Belt Approximate Length 12 ft. Motor Driven

KEYSTONE SOLE & SHANK CO.
601 Washington Street Lynn, Mass.

BALL **BEARINGS** ROLLER
Many Sizes & Types — Large Stocks
PROMPT DELIVERY
Your Inquiries Solicited
Will purchase your surplus material
BEARINGS & MOTIVE SPECIALTIES CO.
29 Amsterdam Ave., New York, N. Y.

Toledo 92B Dibl. Crank SS Press $750.00
Perkins #2 Model A open side 10 ton cap. $125.00
53 Tons ¼ x ⅞ Rd Edge C.R. Steel S/L

A. S. CAMPBELL CO., INC.
East Boston 28, Mass.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT - GUARANTEED

JOSEPH **HYMAN** & SONS

Corner Lexington and Almond Streets
Philadelphia, Pa.

Sell your used machinery by listing them here. Don't permit machines to remain idle when they may be needed elsewhere on the production front.

THE CLEARING HOUSE

OVERHEAD ELECTRIC TRAVELING CRANES

	Tons	Make	Span	Current	Remarks
(1)	3	Shaw	30'0"	230-VDC.	Fl. or Cg. Op.
(1)	5	Cleveland	58'3"	230-VDC.	Cg. Op.
(1)	10	P & H	58'3"	230-VDC.	Cg. Op.
(1)	10	American	54'1½"	230-VDC.	Cg. Op.
(1)	12½	Niles	58'3"	220/3/60-cy.	Cg. Op.
(1)	75/25	Morgan	59'0"	230-VDC.	Cg. Op.

(1)—3-ton Armington Underslung Crane 3-motor type, will arrange for any span up to 30'0" as FL. OR CG. OPERATED.

(2)—3-ton Sprague Underslung Cranes, 20'6" span, 4'6" & 2' overhangs, 230-VDC., will rearrange spans to suit, furnish as hand operated, A.C. or D.C. motors on bridge, 1 or 2-motor hoists, A.C. or D.C.

ALSO HAVE 2-Euclid, 3-ton crane trolleys and (1)—3-ton Shaw practically new, can furnish them as A.C. or D.C., New Bridges to suit your requirements, FL. OR CG. OPERATION.

"Send us your Crane Specifications, we may be able to furnish a rebuilt crane to suit saving you time and money."

BUCKETS

(2)—Hayward Electric 2½-yd. capacity 230-VDC.

(1)—Hayward Electric ¾-yd. cap. 220/440-VAC., 25 or 60-cycle.

(1)—½-yd. and (1)—1½-yd. Single Line Brosuis Buckets.

(1)—¾-yd. Type 2½ 2-line Browning Bucket.

ELECTRIC & AIR MONORAIL HOISTS

(2)—1-ton Shepard's Stationary mounted, 7½-HP. 220/440-VAC., separate variable speed controllers, wraps 32' of ⅜" cable.
(2)—1-ton Shepards, 1 & 2 motors, 230-VDC.
(2)—1-ton Euclid's, 115 or 230-VDC. with trolleys.
(1)—1-ton, 2-motor, 230-VDC. FL. OR CG. OP. CLEVELAND TRAMRAIL HOIST.
(1)—3-ton Northern, 220/440-VAC. variable speed with trolley.
(1)—5-ton, 2-motor, Shepard, 230-VDC. FL. OR CG. OP.
(1)—6-ton LoHed, 220-VAC. with hand operated trolley.
(12)—American Monorail Switches & (100)—4-wheel trolleys.
(3)—2 to 5-ton Shepard Motorized Trolley 3½-HP. motor, 230-VDC.
(1)—10-ton Shepard Motorized Trolley, 10-HP. motor, 230-VDC.

ELECTRIC TRAVELING GANTRY CRANES

SPECIAL: Heavy Duty High Speed 15-ton McMyler, 80'0" span, with Auxiliary Hoist, 30'0" clear lift (IN EXCELLENT CONDITION). Will furnish rebuilt to operate on 220/440-V., 3-PH., 60-CY. or 230-VDC., either as a standard crane or arranged for double drum, 2-line Bucket Service, (as both drums are same diameter and uses 4-parts ¾" cable). 3-ton Milwaukee, 3-motors, cage operated, 230-VDC., 32'3" span, 13'3" overhang each end.

230-VDC. CRANE & MILL MOTORS

(SERIES AND COMPOUND)

	H.P.	MAKE	TYPE	R.P.M.
(1)	1	P & H	5-½x3½	850
(2)	2	Shaw	Class BE	930
(1)	2½	G. E.	CO-2502	750
(1)	2½	(NEW) Reliance	T-224	1600
(4)	3	Shaw	BE	750
(1)	3½	G. E.	CO-2503	975
(1)	7/10	G. E.	MD-102	1025/800
(1)	7½	G. E.	CO-1806	700
(1)	11/15	Westgshe	K-5	700/630
(1)	10	C. W.	BW	650
(1)	20	G. E. 115-V	C.O.-2504	850
(2)	20/30	G. E.	MD-104 (C.P.)	725/575
(3)	25	G. E.	CO-1809	850
(2)	30/45	G. E.	MD-104½ (C.P.)	625/500
(2)	65/85	G. E.	CO-1830	700/650
(1)	85	G. E.	CO-1811	550

(All Motors are Series Wound Except Where Marked C.P. Compound)

T. B. MAC CABE COMPANY
4302 CLARISSA STREET — PHILADELPHIA 40, PA.

OVERHEAD CRANES — TROLLEYS ELECTRIC HOISTS

2—125-ton, 30-ton aux. Morgan Ladle cranes, 4-girder, 230 VDC—Magnetic control.
1—50-ton Morgan Gantry, 60'0" span, 50'0" overhanging each end, 230 VDC.
1—30-ton Morgan, 4-motor, 30'0" span, 230 VDC.
1—25-ton Browning, 4-motor, 96'0" span, 230 VDC. Never used.
1—10-ton Alliance Gantry, 28'0" overhanging one end, 230 VDC.
1—20-ton Morgan, 4-motor, 60'0" span, 230 VDC.
1—7½-ton P. & H. 86'0" span, 20'0" overhanging each end, suitable gantry or overhead.
1—3-yd. bucket crane, 47'0" span, 550 VDC.
1—15-ton Trolley, 2-motor, 230 VDC.
1—3-ton Shepard Hoist, floor mounted, single cable 230 VDC. Can be used as car puller.

JAMES P. ARMEL
925 FULTON BLDG., PITTSBURGH (22), PA.

A DEPENDABLE SOURCE for HEAVY EQUIPMENT

CARS — CRANES — COMPRESSORS
DRAGLINES — LOCOMOTIVES
SHOVELS — TRACTORS — ETC.

WE WELCOME YOUR INQUIRIES

WE WILL FIGURE WITH YOU ON YOUR SURPLUS

B. M. WEISS CO.
Girard Trust Bldg. — Phila. 2, Pa.

RE-NU-BILT
Guaranteed
ELECTRIC POWER EQUIPMENT
A C MOTORS

3 Phase — 60 Cycle

Slip Ring

	HP	Make	Type	Volts	Speed
1—	1200	Cr. Wh.	801Q	2300	237
1—	800	Al. Ch.	ANY	440	885
1—	600	G.E.	IM	2200	900
1—	450	Whse.	CW	2200	875
1—	400	G.E.	MT	550/440	300
1—	400	Al. Ch.	ANY	2300	505
1—	400	Al. Ch.	ANY	440	1200
1—	350	G.E.	MT-442Y	2300	253
1—	300	Whse.	CW	440	585

Squirrel Cage

1—	500	G.E.	1—17B	2200	693
1—	400	Whse.	CS-1104A	2200	585
1—	300	Whse.	CS	550	580
1—	300	G.E.	IK	2300	600
1—	200	G.E.	IK	2200	490
3—	175	G.E.	IK	440	900
1—	150	Lincoln		440	1200

MOTOR GENERATOR SETS

3 Phase — 60 Cycle

1—500 K. W., G.E. 600 v. D.C. gen. d.c. to 700 H.P. 13200 v., syn. motor with exciter.
1—500 K.W., G.E. 250 v., 3 unit, 4 Brg. consisting of 2—250 K.W., 250 v. gens. d.c. to 700 H.P. 2300 v. syn. motor.
1—400 K.W., G.E. 275 v., D.C. Gen. d.c. to 700 H.P. 240 or 2300 syn. motor with exciter. Also available in Jersey City stock a number of modern 60 and 25 cycle converters and D.C. motors.

BELYEA COMPANY, INC.
47 Howell Street, Jersey City, N. J.

MODERN
AIR COMPRESSORS
All Types and Sizes
Rebuilt-Guaranteed
EARL E. KNOX COMPANY
3 West Second St. — Erie, Pa.

CRANES and HOISTS
All Types
Overhead, Hand, Electric, GANTRYS, MONORAIL HOISTS and RUNWAYS
Send Specification of need
N. B. PAYNE & CO., INC.
105 W. 55th St., New York 19 — Tel. Circle 7-6730

AIR COMPRESSORS

BELTED—176 ft., 355 ft., 540 ft. 676 ft., 752 ft. & 1300 ft.
ELECTRIC—355 ft., 528 ft., 676 ft., 807 ft., 1302 ft., 1723 ft., 2022 ft., 2200 ft., 2800 ft., 3600 ft. & 5060 ft.
STEAM—368 ft., 500 ft., 800 ft., 1221 ft., 1640 ft., 2200 ft. & 3000 ft.
DIESEL—368 ft., 603 ft., 900 ft. & 1300 ft.
GASOLINE—110, 160, 220, 310, 1300 ft.

R. C. STANHOPE, INC.
60 East 42nd St. — New York 17, N. Y.

DE LA VERGNE DIESEL SET

One 4 cyl. 4 cy. 17x24, solid injection 400 HP, 330 KVA, 3/60/2300, Type SI, Mod. VA, 225 RPM, dir. con. exciter, control panel, complete auxiliaries. A standby, hardly ever been run, condition perfect and good as new, can be inspected in operation. Write or phone.

ILLINGWORTH ENGINEERING CO.
JACKSONVILLE 2, FLA.

COMPRESSORS
Over 150 In stock
New and Guaranteed Rebuilt
Modern Plant doing Modern Rebuilding
From 50 CFM to 3500 CFM
AMERICAN AIR COMPRESSOR CORP.
Dell Ave. & 48th St., North Bergen, N. J.

LIFTING MAGNETS MOTOR GENERATOR SET

40 kw 250 volt GE CD 105 connected to 60 HP 440-3-60-1200 KT 536 with switchboard
several size magnets in stock
GOODMAN ELECTRIC MACHINERY CO.
1060 Broad St. — Newark, N. J.

THE CLEARING HOUSE

ARE THE CARS YOU WANT LISTED HERE?

25, Ballast, Composite, 50-Ton
150, Box, 36-Ft., 40-Ton; Steel Ends
10, Dump, Koppel, Side-Discharge, 24-Yd., 30-Ton
25, Dump, Magor, Automatic, 30-Yd., 50-Ton
6, Dump, Magor, Automatic, 25-Yd., 50-Ton

Locomotives and Passenger Cars, too!

8, Dump, Western, Automatic, 27-Yd., 40-Ton
2, Dump, Western, Automatic, 27-Yd., 50-Ton
2, Dump, Western, Automatic, 20-Yd., 40-Ton
25, Flat, 40-Ft., 40-Ton
55, Gondola, Composite, 36-Ft. & 40-Ft., 40-Ton
150, Hopper Double, 50-Ton
45, Hopper, Side-Discharge, 50-Ton
100, Refrigerator, 40-Ft., 40-Ton
16, Refrigerator, 36-Ft., 30-Ton

IRON & STEEL PRODUCTS, INC.
(38 years' experience)
13496 S. Brainard Ave., Chicago 33, Ill.
"ANYTHING containing IRON or STEEL"

ALLOY STEEL SCRAP CONSUMERS

We are one of the largest handlers of it!

LOCATION NO HANDICAP!

Perhaps we can furnish the identical scrap for any specifications you require?

If so, consider increased Production and Profit this returns!

Specializing and Experienced!

IRON & STEEL PRODUCTS, INC.
38 years' experience
13496 S. Brainard Ave., Chicago 33, Illinois
"ANYTHING containing IRON or STEEL"

STEEL BARS

Deformed (Corrugated) or Plain (Smooth)

WIRE

In coils or straight lengths or welded wire mesh

SHEETS

(APS) Asphalt Protected Steel

Stock Shipments

From Plants in Jersey City & Baltimore

At Mill Prices

CAPITOL STEEL

CORP. OF NY
15 E. 40th St.
New York 16, NY
Murray Hill 3-7479

LOCOMOTIVES—*SALE or RENT*

1—American 41 ton, 4 wheel, saddle tank, Locomotive, electric lights, steam brakes, ASME boiler, 190 lbs.

1—Lima 80 ton, 6 wheel, Switcher with tender, National Board boiler, 200 lbs. working pressure, super heater, automatic lubrication; excellent condition, immediate delivery.

1—American 68 ton, 6 wheel, Switcher with tender, electric lights, air brakes, power reverse; overhauled.

1—Whitcomb 6 ton, 36" gauge, gasoline driven, Locomotive, electric lights, starter, etc.

MINE HOIST

1—Vulcan, single drum, 96" dia., 78" face, 750 FPM, 500 H.P., A.C. motor, and all control equipment.

CRAWLER CRANE

1—General ¾ yd., crawler tread, with ¾ yd. Blaw Knox clam shell Bucket, powered with Buda diesel motor.

OVERHEAD CRANE

1—Shepard 7½ ton, 36 ft. span, 220 volt, D.C., bucket operating.

A. J. O'NEILL
Lansdowne Theatre Bldg., Lansdowne, Pa.
Phila. Phone: Madison 8300

CARS

500—40 TON BOX
50—50 TON GONDOLAS
50—50 TON HOPPER
10—40 TON FLATS

GENERAL RAILWAY EQUIPMENT COMPANY
Girard Trust Co. Bldg., Phila. 2, Pa.

We BUY and SELL

New Surplus pipe and tubes
Steel buildings
Tanks
Valves and Fittings

JOS. GREENSPON'S SON PIPE CORP.
Natl. Stock Yds., St. Clair Co., Ill.

1-BAKER ELECTRIC FACTORY TRUCK MODEL #36

Platform type — capacity 500#

With 500# trailer hoist and new gasoline ready-power generator

Will lift about 48" off the ground. Platform size: 5'4" long, 3'5" wide. 12" off the ground.

GOOD CONDITION . . .

Morey Machinery Co., Inc.
410 Broome St., New York 13, N. Y.

STEEL BARS FOR SALE

180,000#	¼"	H.R. Rounds SAE 1020	16'—20'
15 Bars	6"	H.R. Rounds SAE 1045	30'—33'
11 Bars	6¼"	H.R. Rounds SAE 1045	29'—30'
22 Bars	6¾"	H.R. Rounds SAE 1045	23'—25'

BARON STEEL COMPANY
4075 Detroit Avenue, Toledo 12, Ohio

CRANES

Overhead Electric Traveling

5 ton Bedford Foundry & Machine Co., 50' span, fish belly type girders, cab operated, 3 phase, 60 cycle, 220 volt motors. Clutch for travel across span driven by hoisting motor.

7½ ton Bedford Foundry & Machine Co., 50' span, fish belly type girders, cab operated, 3 phase, 60 cycle, 220 volt motors. Clutch for travel across span driven by hoisting motor.

Splendid units in all respects—will pass rigid inspection. Located at Mahwah, N. J.

RICHARD P. WALSH CO.
30 Church St., New York 7, N. Y.

40 ton capacity Browning Locomotive crane.
35 ton capacity McMyler Locomotive Crane.
30 ton capacity Industrial Locomotive crane.
25 ton capacity Browning Locomotive crane.
20 ton capacity Ohio Locomotive crane.
12 ton capacity Gas Powered Locomotive crane.
50 ton capacity Broad Gauge Locomotive crane.
50 ton capacity Twin Hopper Railroad car.
20 ton capacity Electric Locomotive.
65 ton Switching Locomotive.
70 ton Shay Geared Locomotive.
120 ton capacity Locomotives 0-4-0.
½ yd. to 5 yd. Clam shell buckets.
⅜ yd. to 1½ yd. Crawler cranes, gas and Diesel.
50 to 75 ton Stiff Leg Derricks.
25 ton Gantry crane, all electric.

"STONE the CRANE MAN"
502 Insurance Exchange Bldg., Detroit (1), Michigan

PIPE

VALVES and FITTINGS
All Sizes in Stock
NEW-USED

GREENPOINT IRON & PIPE CO., INC.
Bogart, Stagg & Meadow Sts. Brooklyn, N.Y.

ALBERT & DAVIDSON PIPE CORP.

PIPE
NEW-USED-UNTESTED
2nd Ave. 50th-51st St. Est. 1904 Brooklyn, N.Y.

MACHINES FOR YOUR YARD

Silent Hoist Tractor Crane
Northwest 1 yd. Crawler Crane
Williams No. 1 Hammermill
Barber-Greene 24x40 Conveyor
Haiss Model 80 Bucket Loader
Caterpillar Diesel 40 Bulldozer

TRACTOR & EQUIPMENT CO.
3507 W. 51st St. Chicago 32

FOR SALE

25 Tons, new ends 1¼" cold rolled steel bars 6" to 18" long.

AMERICAN SALES COMPANY
1562 Harrison Avenue, Cincinnati 14, Ohio

New and Used
RAIL & INDUSTRIAL EQUIPMENT CO.
30 Church St., New York 7, N.Y.
41 Years ENGINEERING EXPERIENCE

THE CLEARING HOUSE

We mean
MORE FOR YOUR DOLLAR
in
"*ANYTHING* containing IRON or STEEL"
TRY US WHEN OTHERS FAIL!
OUR "LINE"

CARS: freight industrial, etc.
CAR REPAIR PARTS;
LOCOMOTIVES: any kind
PASSENGER-TRAIN CARS: any kind
RAILS, relaying. Any delivery
IRON & STEEL: Merchant
SURPLUS, OBSOLETE and REJECTED STOCKS: new or used.
BUILDINGS & STRUCTURES: steel
CRANES; ground, overhead and gantry. Also runways
POWER PLANT EQUIPMENT; boilers, generators, turbines, motors, etc.
EARTH HANDLING EQUIPMENT: mining, quarry, contractors', etc.
ABANDONED PLANTS, MACHINERY & EQUIPMENT
SCRAP-IRON; plain, nickel, tungsten, etc.

IRON & STEEL PRODUCTS, INC.
38 years' experience
13496 S. Brainard Ave., Chicago 33, Illinois
SELLERS BUYERS TRADERS

CARS SPECIAL 100—All Steel 50 TON Hoppers

35—40 ton steel u/f flats.
20—50 ton steel u/f flats.
15—30 ft. all-steel Gons. A1 condition
200—30 ton steel u/f box cars.
25—50 ton all-steel Gons.
25—30 ton steel Gons., St. Ga. Blt. 1928

LOCOMOTIVE CRANES
Saddle Tank Locomotives

RAILS
Complete Stocks at 90# 85# 75# 70# 65# 60# and lighter weights, with angle bars, carried at principal points throughout the country, available for rail or water shipment.

HYMAN-MICHAELS COMPANY
122 So. Michigan Ave. Chicago 3

RAILS NEW AND RELAYING
TRACK ACCESSORIES
from **5** *Warehouses*
• PROMPT SHIPMENTS
• FABRICATING FACILITIES
• TRACKAGE SPECIALISTS
EVERYTHING FROM ONE SOURCE
L. B. FOSTER COMPANY
PITTSBURGH • CHICAGO • NEW YORK

RELAYER RAILS
2,000 tons of 60 lb. and 70 lb. relayer rails and splice bars ready for prompt shipment in East. Spikes, bolts, tie plates, frog and switch material.

M. K. FRANK
810 Park Bldg., Fifth Avenue
Pittsburgh 22, Pa.

RAIL - ACCESSORIES
RAILWAY EQUIPMENT
• BOUGHT • SOLD •
WRITE WIRE PHONE
DULIEN STEEL PRODUCTS, INC.
414 First Ave., So. Seattle, Wash.
2280 Woolworth Bldg., New York, N. Y.

WANTED

WANTED
Rotary table for milling machine 18" to 24". Must have T slots and be turned by worm—2 units required.
F. H. CRAWFORD & CO., INC.
30 Church Street New York 7, N. Y.

WANT TO BUY
Nos. 0, 10, and 20 WATERBURY-FARREL THREAD ROLLERS
Give age and full information in reply to
BOX B-91
Care *The Iron Age*, 100 E. 42nd St., New York 17

DESIRED IMMEDIATELY
Manufacturer of standard Carbide blanks and standard Carbide tip tools that will compete with competitive makes. Ready to place orders. Must have prompt delivery.
ADDRESS BOX B-107
Care *The Iron Age*, 100 E. 42nd St., New York 17

WANTED
1—Modern 4-Spindle Upright Drill Press, 220-440 V. 60-cycle, 3-phase, 1¼" or 1½" Capacity in mild steel.
BARNETT FOUNDRY & MACHINE CO.
536 Lyons Avenue, Irvington 11, New Jersey

WE WILL PURCHASE
your surplus
SCREWS, BOLTS, HARDWARE, etc.
Send us your lists.
GLOBE BOLT & SCREW CO.
125 Grand St., N. Y. C.

"*ANYTHING* containing IRON or STEEL"
IRON & STEEL PRODUCTS, INC.
38 years' experience
13496 S. Brainard Ave., Chicago 33, Illinois
Phone: BAYport 3456

BUSINESS OPPORTUNITIES

United Steel Corporation, Ltd.
58 Pelham Avenue, Toronto, Ontario
Canadian Corporation operating 4 modern plants capable of producing Machinery and Equipment for any purpose, interested in establishing connections with American Companies for Manufacturing and Sales rights in Canada.

NEW INVENTIONS WANTED
Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.
P. O. Box 217, Denville, N. J.

EMPLOYMENT EXCHANGE

EXECUTIVES' *Personnel*
• ORGANIZATION BUILDERS
• PERSONNEL PROBLEMS
Intelligently Analyzed
EXECUTIVES' PERSONNEL SERVICE
1336 Book Tower Detroit 26, Mich.
Phone—Cadillac 3480

MANUFACTURING EXECUTIVES and TECHNICAL MEN
Qualified men wanted for openings throughout the United States. Write for application or submit experience record. Salaries: $3,000 to $20,000. Inquiries solicited from responsible employers. All negotiations confidential. Est. 28 yrs.
HARRISON PERSONNEL SERVICE
20 W. JACKSON BLVD., CHICAGO 4

SALARIED POSITIONS — This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive position. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. BIXBY, Inc., 274 Delward Bldg., Buffalo 2, N. Y.

HELP WANTED

WANTED
MACHINE DESIGNERS
and
TOOL DESIGNERS
Men wanted for war work today who will stay with company in postwar period.
Pleasant midwestern town of 11,000 population; low living costs; very modern plant.
Give age, draft status, experience, references, availability, and salary expected.
THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

SALES ENGINEER—INDUSTRIAL
Mechanical or Metallurgical with knowledge of Tubing and bar stock manufacturing methods, to arrange for installations of Electric Flaw Detecting apparatus. Those now in essential, war work do not reply. Statement of availability required. State full details. Box 185 Equity, 113 West 42nd St. New York.

ASSISTANT FOUNDRY SUPERINTENDENT—For automotive Foundry with post war program located in Western Michigan. Applicant must be man of proven ability, thoroughly grounded in all foundry practices. In reply list all qualifications including salary desired. Statement of availability required. Address Box B-102, care *The Iron Age*, 100 E. 42nd St., New York 17.

PATENT DRAFTSMAN WANTED. Must be experienced in the art of making first class patent drawings. Excellent prospects for individual who can fit into heavy equipment development program. Give complete details of experience, salary expected, and personal history in first letter. Statement of availability required. Address Box B-110, care *The Iron Age*, 100 E. 42nd St., New York 17.

TOOL MAKERS for defense plant in Central West: give experience and full particulars. Persons in war work or essential activity not considered without statement of availability. Address Box V-904, care *The Iron Age*, 100 E. 42nd St., New York 17.

EMPLOYMENT EXCHANGE

HELP WANTED

WORKS MANAGER

Thoroughly experienced, practical man to take complete charge of heavy jobbing steel foundry, with some production work. Plant manufactures 1,000 tons of commercial steel per month. Located in the Eastern Michigan industrial section. Old, thoroughly established firm. Permanent position for the right man. Give full details in first letter.

Statement of availability required.

ADDRESS BOX B-105
Care *The Iron Age*, 100 E. 42nd St., New York 17

Structural Steel Designer for large southern fabricating plant, experienced in riveted and welded design. Must be capable of developing new designs and have cooperative spirit. State salary expected and give three references.

Statement of availability required

ADDRESS BOX B-100
Care *The Iron Age*, 100 E. 42nd St., New York 17

SUPERINTENDENT, general welded steel plate construction ⅛" to ½". Not required to be a layerout, fitter, or welder of course, but must have done this work at one time. Salary, bonus, excellent opportunity now and in peace times. Now 100% defense. Location, Eastern New York. Statement of availability required. Address Box B-83, care *The Iron Age*, 100 E. 42nd St., New York 17.

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense work by old established company in Central West; give experience and full particulars. Persons in war work or essential activity not considered without statement of availability. Address Box V-905, care *The Iron Age*, 100 E. 42nd St., New York 17.

STEEL SALESMAN: for eastern territory including New England states, also for New York State and Northern Pennsylvania. To represent tool steel mill producing high grade tool and special steels. Tool steel experience essential with preference given to those having some metallurgical training. Correspondence invited. Statement of availability required. Address Box B-112, care *The Iron Age*, 100 E. 42nd St., New York 17.

HELP WANTED

SUPERINTENDENT

For Cleaning, Finishing and Shipping Departments

Of heavy jobbing steel foundry with some production work. Plant manufactures 1,000 tons of commercial steel per month and is located in the Eastern Michigan industrial section. Man wanted must take full charge of departments named above and also of Annealing and Welding. For a thoroughly experienced man who can really get out production, this job will be permanent and will pay handsomely. Give full details in first letter. Statement of availability required.

ADDRESS BOX B-104
Care *The Iron Age*, 100 E. 42nd St., New York 17

ACCOUNTS WANTED

SALES REPRESENTATION FOR TECHNICAL PRODUCTS

Our resident engineering sales representatives including many professional engineers, with offices in 37 cities, enjoy long established contacts in the industrial and utility fields. They represent products of well established companies and can also arrange local warehousing and supervise maintenance if required. We finance ourselves. Straight commission basis. No salaries, no advances, no expenses. The risk is ours. If we like your product, we may take on your weakest territory. Our men average over 8 years of representation per company. Arrangements may be made for our local resident men to work in direct contact with you. Address our Mr. Edmonson.

EISEMANN INDUSTRIAL CORP.
Manufacturers Trust Bldg.
Columbus Circle, N. Y. 23, N. Y.

POSTWAR PLANNERS

Sales Engineer with foundry, forging, gear, die casting and complete machining experience can take on one more line for sale to industrial plants. Cleveland office established for 25 years. Territory: Ohio, Northwestern Penna. and Western New York.

ADDRESS BOX C-1101
Care *The Iron Age*, 1016 Guardian Bldg., Cleveland 14

SITUATIONS WANTED

SALESMAN EXECUTIVE — Former chief chemist steel plant. Twenty years in scientific sales work including steel. Desire executive or assistant executive connection where sales experience combined with technical knowledge will prove of mutual advantage. Address Box B-75, care *The Iron Age*, 100 E. 42nd St., New York 17.

CONNECTION wanted by capable Rolling Mill Supervisor, Experienced in Organization, Operation, and Maintenance. Familiar with all grades of Open Hearth and Bessemer Steels. Future prospects first consideration. Address Box B-103, care *The Iron Age*, 100 E. 42nd St., New York 17.

INDUSTRIAL MANAGER: capable engineer, master mechanic, cost expert. Long experience; precision manufacture, metal specialties. Secure results you want in production or profits, harmoniously, rapidly, with present equipment. Want heavy assignment, full responsibility. Age 48, American, Protestant. Principals; Address: Box B-85, care *The Iron Age*, 100 E. 42nd St., New York 17.

PLANT MANAGER-SUPERINTENDENT; Seasoned executive, draft deferred, experienced metal stampings; screw machine products; castings; forgings; electronic assembly. Management-employee cooperation. Address Box V-964, care *The Iron Age*, 100 E. 42nd St., New York 17.

CHEMIST — METALLURGIST — Unusual wide experience embracing supervision, and doing Chemical Analysis, Physical Testing, Heat-Treating, Metallography, Electroplating, also two years' Teaching. This work covers both Ferrous and Non-Ferrous industries. Address Box B-79, care *The Iron Age*, 100 E. 42nd St., New York 17.

FACTORY MANAGER OR SUPERINTENDENT. Capable man desires contact reliable manufacturer for permanent position. Thoroughly experienced in all phases production management. Fully capable to direct manufacturing plant and produce results. Address Box B-88, care *The Iron Age*, 100 E. 42nd St., New York 17.

ESTABLISHED SALES ENGINEER located in New York City with wide acquaintance and good contacts from New York to Baltimore, Md., is now making post-war arrangements. Products wanted—Round and Flat Alloys, Shapes, Steel Specialties such as razor blade, wood and metal band saw and tape steels, clock springs, music wire and other high carbon wires, tempered and untempered. Also interested in powder metallurgy. Commission only. Address Box B-69, care *The Iron Age*, 100 E. 42nd St., New York 17.

PRODUCTION CONTROL MAN seeks lively concern and present, postwar position with outlet for ideas and initiative. Experienced industrial supervision; planning, scheduling, coordinating production. Draft-deferred. Address Box B-114, care *The Iron Age*, 100 E. 42nd St., New York 17.

NOTICE TO "HELP WANTED" ADVERTISERS

A regulation by the War Manpower Commission requires that all "Help Wanted" advertisements must include the following:

"Statement of availability required"

THE IRON AGE

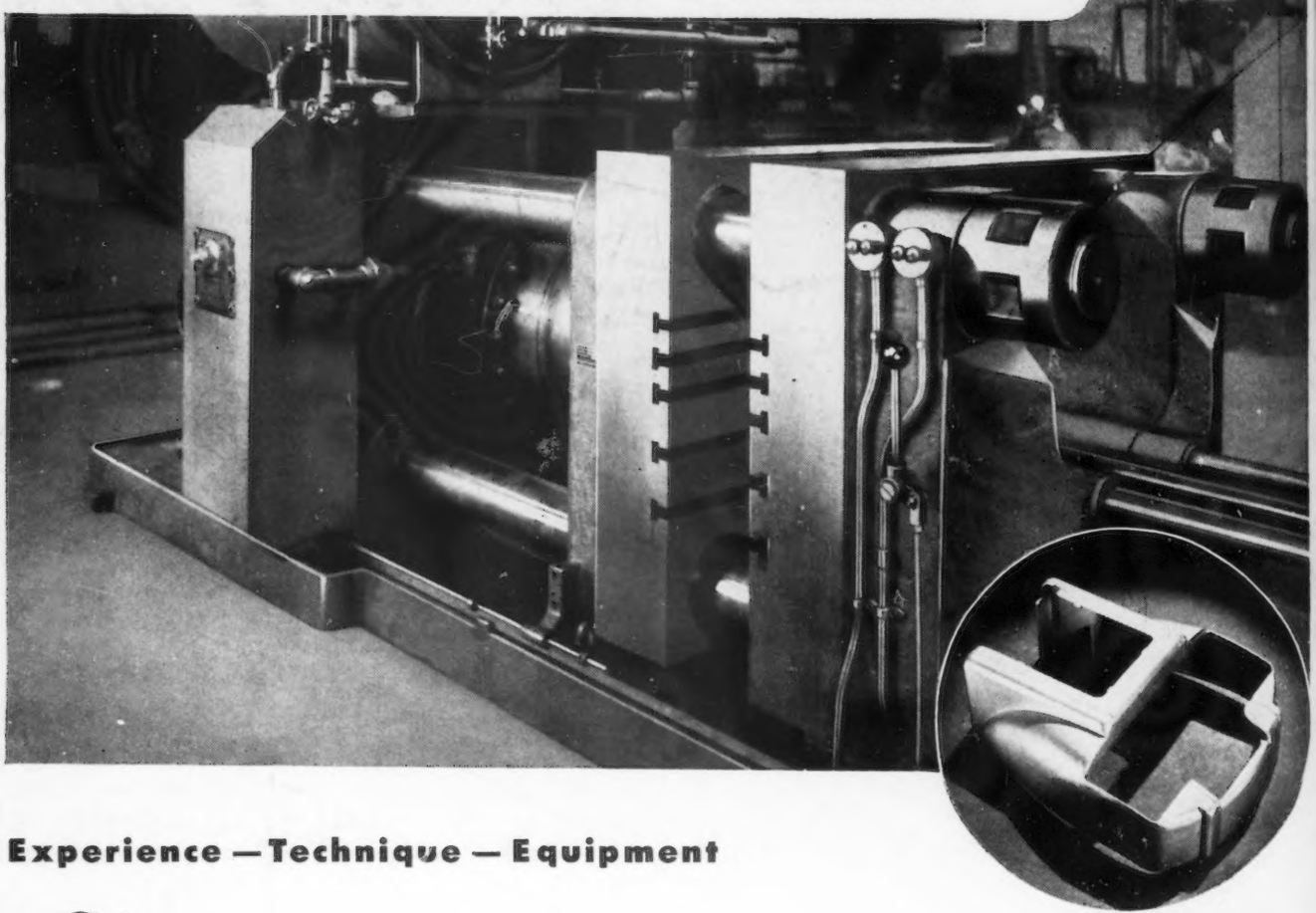
100 East 42nd Street **New York 17, N. Y.**

ADVERTISERS IN THIS ISSUE

ADVERTISERS IN THIS ISSUE

CLASSIFIED SECTION

A DOW MAGNESIUM SERVICE—DIE CASTINGS



Experience—Technique—Equipment

Advancements in the techniques of die casting Dowmetal Magnesium alloys are an integral part of Dow's long and intimate association with magnesium.

Magnesium Die Castings made by Dow offer such advantages as low cost in quantity production, dimensional accuracy, weight saving by ability to cast thin sections and decrease in machining.

Long experience has made Dow the recognized source of authentic information on magnesium—covering a range from ingots to finished products. Regardless of the form of fabrication, if this weight-saving metal is to be used, consult Dow.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Cleveland • Chicago • St. Louis • Houston • San Francisco
Los Angeles • Seattle

MAGNESIUM

PRODUCER SINCE 1916

DOWMETAL

FROM INGOTS TO FINISHED PRODUCTS

INGOTS • CASTINGS • FORGINGS • SHEET • STRIP PLATE • EXTRUSIONS

THE NEW BRITAIN MACHINE CO. • NEW BRITAIN, CONNECTICUT.

nized
ium—
ducts.
eight-

GAN
rancisco

IONS